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A TECHNIQUE OF RESECTION OF THE MALE RECTUM[1]

WITH THE REPORT OF A CASE

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A PRIMARY object of this paper is to attempt to establish generally the operative technique of rectal resection on a more scientific basis than has been done heretofore. It is believed also that the illustrations made with photographic exactness demonstrate the great practicability of the abdominal route for primary approach in the removal of all cancers of the rectum and anus, and that such demonstration must exert an influence in converting dissenters from the proposition of primary abdominal approach, who can see a correct technique only by approach through one of the lower routes.

Resection of the rectum with circular suture of the bowel ends through a posterior wound has been successfully performed by Kraske, the originator of the operation, also by von Bergmann, Poppert, Vogel-Schede, Schneider-Garré, Czerny, Wölfler, Rotter, and Prutz. Schloffer collected nine cases of resection of the rectum by the combined routes, seven of whom died. Trendelenburg, Schloffer and Edebohls have each successfully performed sigmoid-rectal anastomosis with suture by the abdominal route alone. The cases of each of the above operators have all been discussed in detail elsewhere (1) by the writer.

Recently Tuttle (2) in a record of 100 cases of excision of the rectum done by himself, enumerates 17 cases of resection of the rectum with end to end suture of the bowel ends through a posterior or a vaginal approach. There were two deaths, one from sloughing of four inches of the proximal bowel end and the other from a secondary hæmorrhage from the internal pudic artery. Of those who survived, eleven had perfect continence, three good, and one fair, continence, "good continence" being applied to "the condition which the patient under a state of excitement or strain is unable to control gases or liquid fæces." All the resections but one recovered with fistulæ which eventually closed. Tuttle concludes "it would appear . . . . that, although resections were accompanied by a higher mortality and longer detention in the hospital than amputations, the final results of the former are more satisfactory in the majority of cases than those of the latter." Also of recent date, Proust (3) has declared in favor of Kraske's operation of resection by the posterior route as preferable to amputation. He says, referring to the stated advantages of amputation, "are they sufficient to take the place of the real benefits which can accrue to a patient from a resection which leaves intact the sphincter function?"

Though formerly the operative mortality of all operators was much higher following resection than following amputation through a posterior approach, in recent years the sta-

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tistics of both Poppert (4) and of Rotter (5) (Petermann's report), show this ratio reversed, which bespeaks the development of an improved technique. Thus Poppert has reported 35 amputations with a mortality of 8.6 per cent and 28 resections with one death or 3.6 per cent mortality, and Petermann reported a series of Rotter's cases from 1903 to 1906 consisting of 23 amputations with a mortality of 4.8 per cent and 19 resections without a death. Rotter's previous series of cases from 1893 to 1903 consisted of 23 amputations with a mortality of 23.5 per cent and 26 resections (includes implantations) with a mortality of 38.4 per cent, in comparison with which his later record would seem to demonstrate an evident increased skill in performing the operation of resection.

The writer has worked out the following technique for resection of the male rectum, which was practiced in all essentials on the case here reported. He counts the success of the sigmoido-rectal anastomosis in this patient as directly due to his having previously had the opportunity to witness Kraske perform his operation of resectio recti, through the latter's courtesy.

A TECHNIQUE OF RESECTION OF THE MALE RECTUM

The technique includes the use of the combined routes, Rotter's technique of sectioning the descended bowel through the posterior wound after first liberating it through the abdominal approach, and Kraske's position of vertical elevation of the hips with the patient

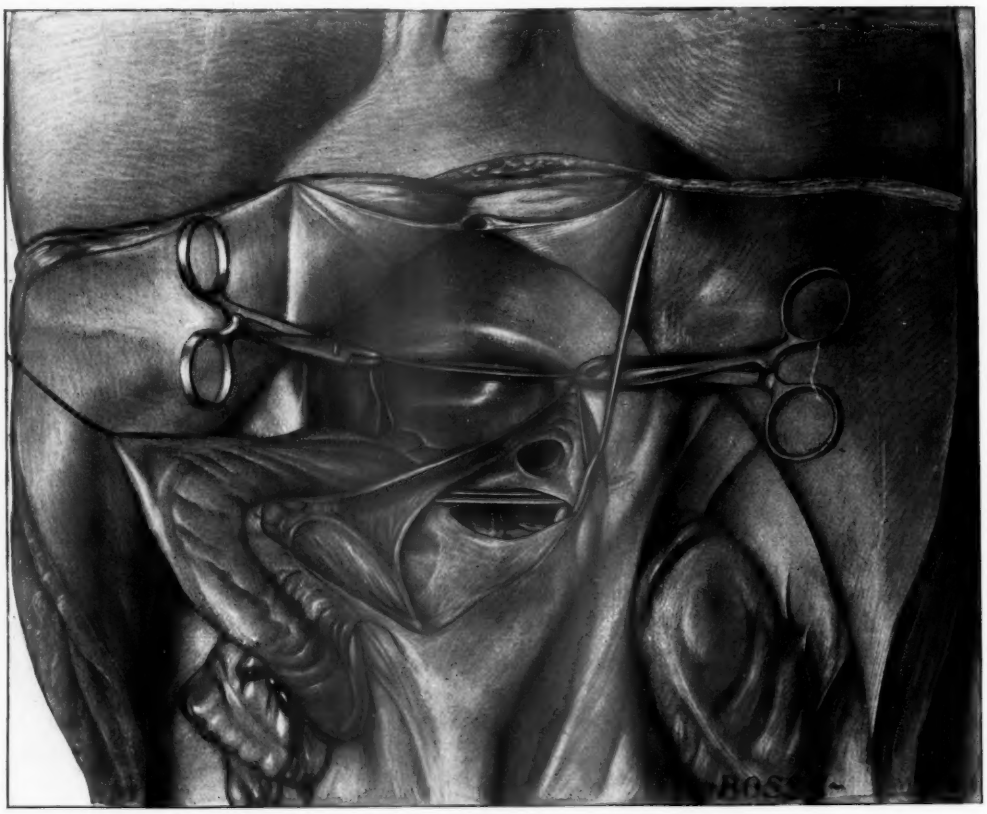

Fig. 1.

in the dorsal decubitus for suture of the bowel ends, as well as the method Kraske employs in sacral resection of dividing the proximal segment of bowel above the tumor with interrupted cuttings as the stitches are placed.

The fascia propria recti. In connection with rectal enucleation there is one anatomical structure which has a considerable surgical importance and that is the fascia propria recti (Waldeyer's nomenclature), (Figs. 1 and 4). This structure is continuous above with fascia lying over the front of the spinal column and below becomes closely adherent to the posterior rectal coverings, so that it has the mechanical action of a *broad suspensory ligament* to the rectum. It extends laterally to sites of its attachment to the pelvic wall and floor. Thus it can be seen that in order to free the rectum this binding fascia must be detached from its parietal connections. The *pelvic retrointestinal plane of cleavage* (Fig. 1) corresponds to the anterior surface of the fascia propria recti above its line of close adhesion with the rectal coverings. The latter line is usually situated at about the tip of the sacrum, but sometimes is at the level of the third sacral vertebra, so

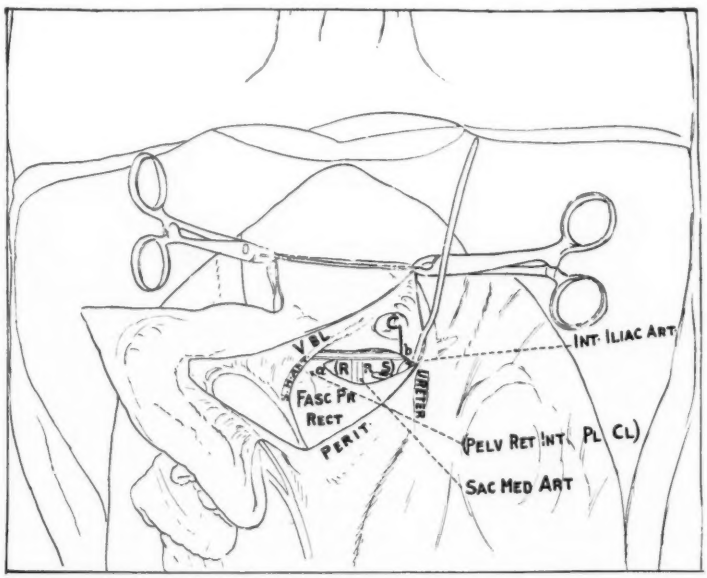

Fig. 1. Through an incision in the peritoneum along the sulcus at the left side of the promontory and fifth lumbar vertebra, the cellular tissue just to the right of the superior hæmorrhoidal vessels is carefully teased through to get behind these vessels and raise them forward, in effecting which there is entered the pelvic retrointestinal plane of cleavage (P Ri Pl Cl) which when opened up raises forward the vascular bowel layer (V B L) carrying the vessels to the bowel, and the lateral peritoneal reflections from the bowel, from off of the fascia propria recti (Fasc Pr Rect) (see p. 496). As this plane of cleavage is split apart downward and laterally the raised peritoneum is cut from along the bowel on either side, not too widely. The cleavage is extended downward along the sides of the bowel raising the peritoneum in a line for its division down to the base of the bladder. The fascia propria recti is caught up with forceps over the middle of the sacrum and snipped with scissors making the opening (*ab*) into the retrorectal space (Rr S). Lateral cleavage with the finger in the upper part of this space beneath the fascia propria recti, reaches directly the internal iliac artery (*hook*), and continued outward in front of the latter (course of *director*) first raises off from it the ureter together with its sheath connected with the peritoneal layer, and then passing beyond lifts the peritoneum off from the external iliac vessels. This channel leads directly to the region of the external iliac glands. Lateral cleavage in the lower portion of the retrorectal space proceeds until arrested by the resistance of the lateral pelvirectal attachments (Fig. 2). The fascia propria recti can be separated back (*c*) from the latter and divided independently (Fig. 2 *ad*), or better, both layers are isolated together and divided as one structure. (*bc*) Incision to enlarge opening in fascia propria recti. The fascia propria recti should be stripped forward out of the sacral hollow down to the tip of the sacrum. The two artery forceps catch up a fold of peritoneum across the base of the bladder in a line about half an inch above the rectovesical junction. The peritoneum is divided here by cutting off the crest of the fold with scissors, for approach to the prerectal space (see p. 494).

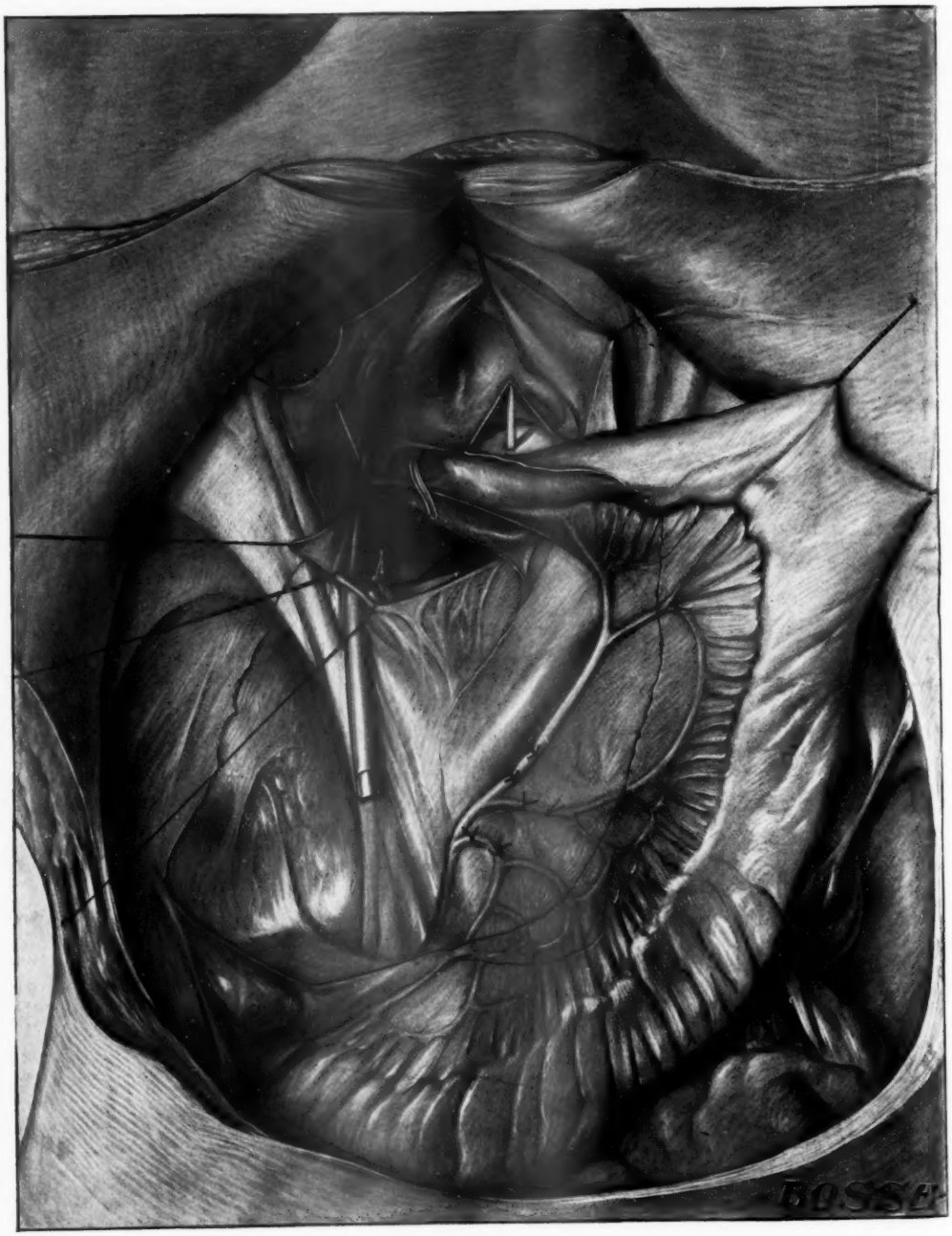

Fig. 2.

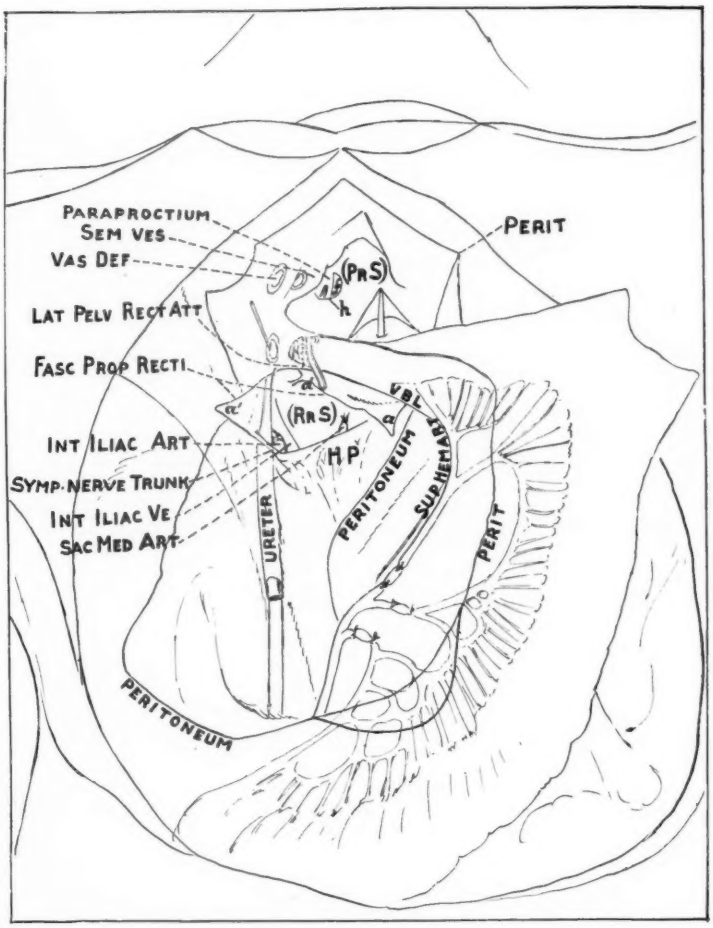

Fig. 2 shows the deep extraperitoneal dissection. All the deep lateral attachments of the rectum are below the level of the ureter. By cutting the left peritoneal leaf of the mesosigmoid as far as to the upper part of the iliac fossa, the sigmoid colon together with its vascular attachments can be stripped up to the right, which exposes the sigmoid vessels for their ligature, and in this cadaver where the sigmoid was gathered into coils (Fig. 1) by the shortness of this left peritoneal leaf, the severance of the latter enabled as well the bowel to be spread out into one loop. *The high cutting of the left peritoneal attachment of the sigmoid in the iliac fossa allows a maximum descent of the liberated bowel.* Between the prerectal (Pr S) and retrorectal (Rr S) spaces the lateral attachments of the rectum are shown partly dissected, in accordance with the course of operative procedure. The fascia propria recti (F P R) has been already severed (*ad* cut edge) down to opposite the third or fourth sacral foramen which facilitates access to the internal iliac artery. The outer severed segment (*a'*) of this fascia is seen attached along the ureter down to where the latter passes forward above the deep latera attachments of the rectum. A lateral pelvirectal attachment (Lat P–R Att) has been split off posteriorly from these rectal attachments, consisting of fibrous structure supporting sympathetic nerve branches to the rectum and therefore unyielding. It is continuous below with the attachment (Fig. 4 *mxn*) of the more delicate fascia propria recti to the fascia covering the levator ani, which it meets at an angle around the fourth sacral foramen (Fig. 8). The guide to finding this cleavage (*k*) is the edge of the vascular bowel layer (V B L). The division of this tough lateral attachment from above is very necessary to facilitate hooking downward for severance through the posterior wound (Fig. 5) the tissues here seen raised on the grooved director. The latter tissues consisting of paraproctium and the fascia lining the prerectal space may however be divided from above instead of from below (see Fig. 8). The director lies in a plane of cleavage between the paraproctium and the fascia covering the levator ani (cf. Fig. 8). The opening (*h*) in the prerectal fascia

that the depth of this plane of cleavage may vary. Posterior to the fascia propria recti, between it and the sacrum, is the *rectrorectal space*, which must be entered through an opening (Fig. 1 *ab*) in the fascia propria recti above its line of adhesion with the rectal coverings so as to continue the enucleation downward behind the rectum in a cleavable area. The sites of lateral attachment of the fascia propria recti to the pelvic wall and floor are seen in the illustrations as follows: In the upper part of the pelvic cavity, to the fibrous sheath of the ureter (Fig. 2 *a'*), in the mid-pelvis to the pelvic wall (Fig. 1 *c* and Fig. 2 *ad*) behind the tough lateral pelvi-rectal attachment (Fig. 2 Lat P-R Att), and in the lower pelvis along a line (Fig. 4 *mxn*) from the fourth anterior sacral foramen (*m*) across the lesser sacro-sciatic ligament to the spine of the ischium (*x*) and thence downward across the fascia covering the levator ani to a postero-lateral point (*n*) on the bowel just above the anus (*cf.* Fig. 5). In the freeing of the rectum all these lateral fascial attachments must be divided as well as cross severance (Fig. 1 *abc*) of the middle portion of the fascia propria recti made in an upper area where it hangs free. Lying in the fascia propria recti opposite the promontory is the hypogastric plexus (Fig. 2 H P) of the sympathetic, from which two main nerve trunks (Fig. 2 Symp Ne Trunk) pass downward diverging laterally one to either side of the pelvic cavity to connect with its corresponding pelvic sympathetic plexus. It would therefore seem best in selecting a site for opening through this fascia, to pick out a locality within the angle formed by the two diverging lateral nerve cords, which would be about opposite the middle of the sacrum (Fig. 1 *ab*).

A median abdominal incision should be made, through which first the liver should be palpated for metastases. The patient had no such metastases nor any palpably enlarged iliac glands.

Opening up of the pelvic retrointestinal plane of cleavage. This is shown in Fig. 1. It accomplishes the raising of the bowel, together with its posteriorly associated vascular and lymphatic structures and its lateral peritoneal reflections, off from the fascia propria recti in the upper part of the pelvic cavity. As a result, the lateral peritoneal attachments of the bowel can be readily cut through with a scissors, the superior hæmorrhoidal vessels exposed for their ligature, and the fascia propria recti approached at a situation where it can best be severed (Fig. 1 *abc*) from its upper parietal connections.

The technique of entering the pelvic retrointestinal plane of cleavage is as follows: Through a median abdominal incision with the patient in the high Trendelenburg position make an incision through the peritoneum in a line corresponding to the sulcus at the left side of the promontory and fifth lumbar vertebra. This is directly in the line of the superior hæmorrhoidal vessels, which are dissected out of their bed by teasing through the fascia just to the right of them, care being taken in so doing not to make a deep cut in this situation which would render liable injury to the left common iliac vein as it crosses the body of the fifth lumbar vertebra. When the finger can be gotten beneath these vessels and can raise them up, the loophole thus made is the portal of entrance to the pelvic retrointestinal plane of cleavage, which should then be opened up with the fingers downward and laterally. The peritoneal incision is now enlarged downward along the right side of the bowel, the finger within the plane of cleavage raising the peritoneum off from the fascia propria recti in advance of cutting it. In this procedure there is no danger of cutting the ureter, since both the fascia propria recti (Fig. 2 *a'*) and the peritoneum in this region are connected with the ureteral sheath, so that any point of the peritoneal reflection from the bowel which can be raised free from off the fascia propria recti must lie internal to the line of the ureter. The peritoneum should

Fig. 2, *continued.*

is located about half an inch from the middle portion of the outer border of the seminal vesicle. It sometimes can be made with blunt force but here it had to be cut. The opening leads into a V-shaped plane of cleavage (cf. Fig. 8, *j*) without the rectal sheath (*j* on sheath) in the bottom of which the paraproctial layer (P A R A P R O C) proper is here seen. A blowpipe has been introduced into the ureter. Near the bladder the ureter has been dissected out and made prominent over a needle. Vas deferens seen through opening in fascia overlying it. HP, hypogastric plexus of sympathetic. Symp Ne Trunk, cord-like in fascia.

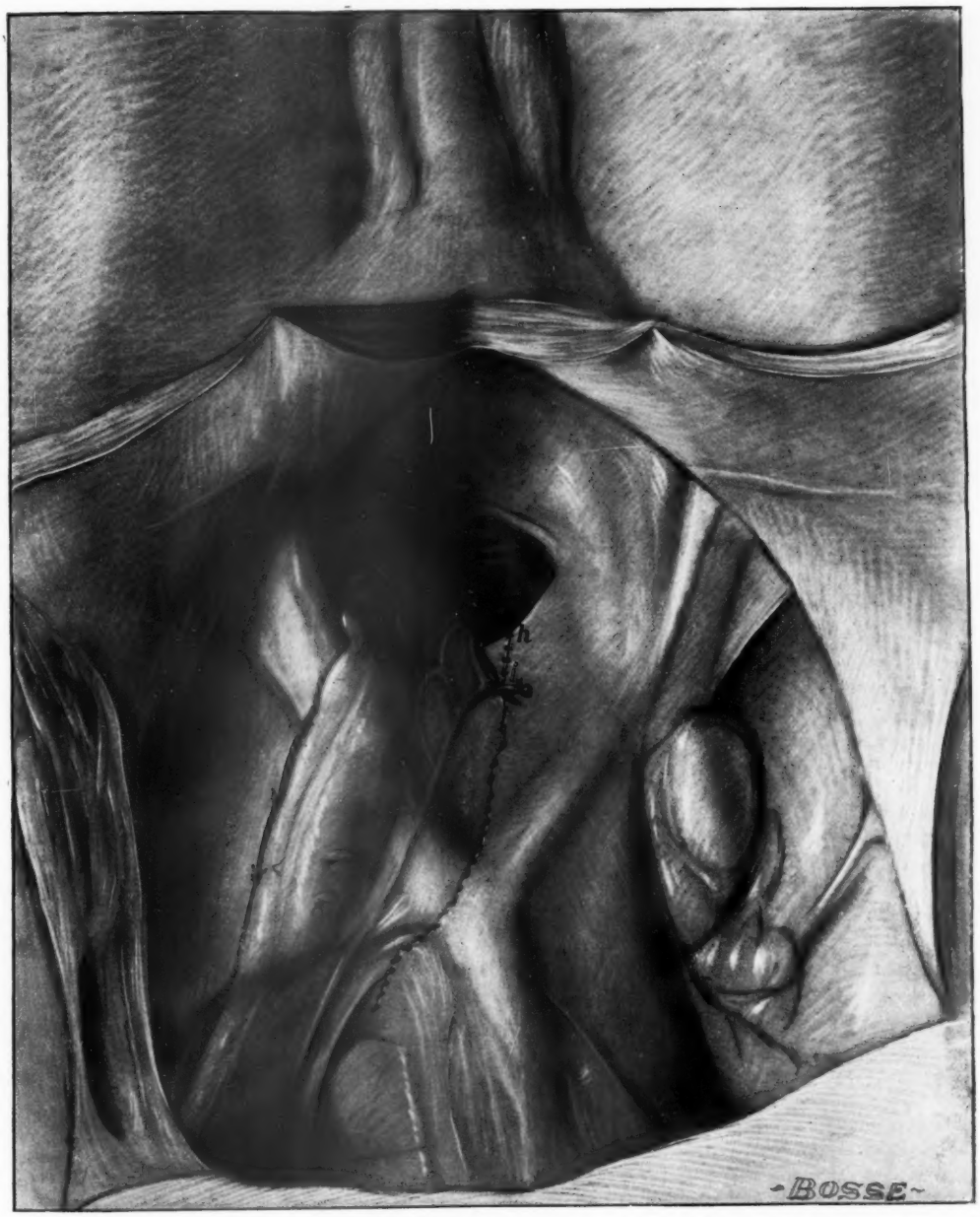

Fig. 3 shows the narrowing of the peritoneal opening at the bottom of the pouch (by the line of suture *hi*) around the descended bowel, and suggests a technique for the repair of a peritoneal defect caused by a wide setting of the parietal peritoneal attachments of the sigmoid (see p. 503). In the patient operated upon the latter attachments were more closely set than here, so that peritoneal closure in the iliac fossa and upper part of the pelvic cavity was easily brought about by simply drawing the serous edges together behind the liberated bowel.

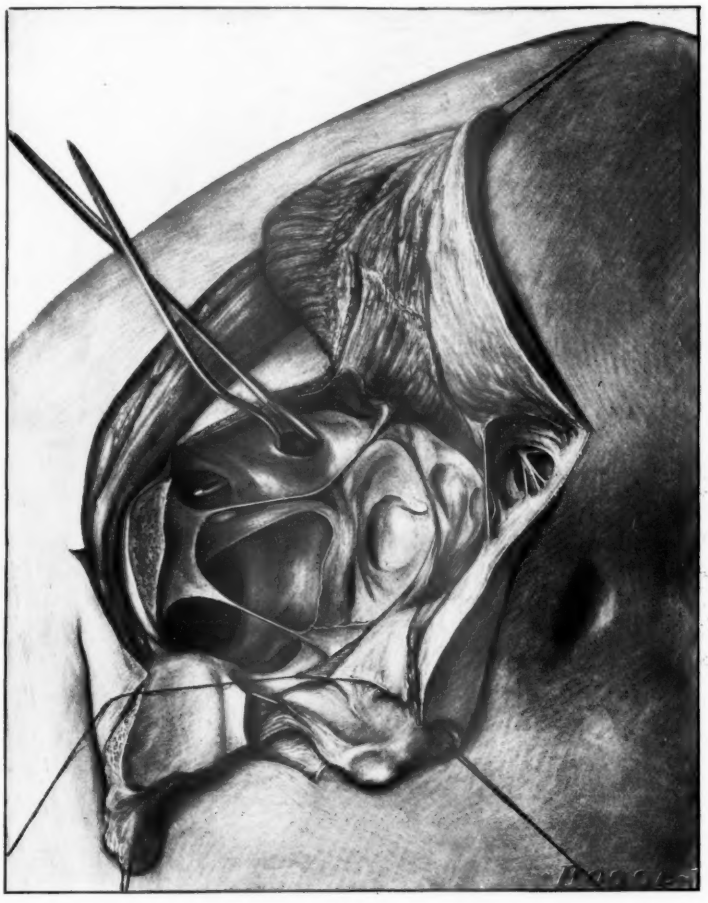

Fig. 4.

not however be cut unnecessarily widely from the bowel or the remaining flaps may not be able to be brought together in narrowing the pelvic peritoneal opening (see page 503 and Fig. 3 *hi*). At the site where the peritoneum leaves its apposition with the fascia propria recti and becomes reflected forward above the deep lateral attachments (Fig. 2) of the rectum to reach the bladder, there the finger effecting the cleavage changes its direction and is passed forward along the side of the bowel, hugging the under surface of the peritoneum which it raises in a line for its severance, forward to the base of the bladder. This lower portion of the line of peritoneal severance thus outlined, also lies internal to the course of the ureter. Cleavage of this space can be assisted by traction with clamps on the edges of the peritoneal opening. When the right peritoneal reflection has been cut, the fingers pushed through the plane of cleavage behind the bowel raise the left peritoneal attachment for its severance, which is then cut all the way down to the base of the bladder after the same manner of procedure as was practiced on the right side.

The opening up of the retrorectal space. Seize a fold of the fascia propria recti over the middle of the sacrum with a long handled for-

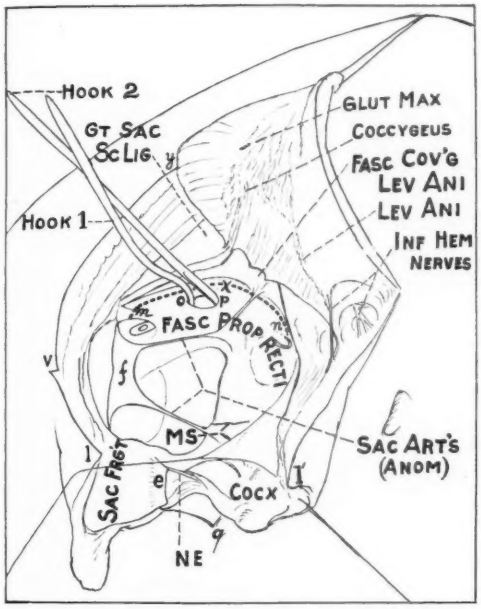

Fig. 4. Through the writer's posterior approach (see p. 503) the lower posterolateral fascial attachments (*mxn*) of the fascia propria recti to the structures of the pelvic wall and floor are exposed for detachment. The spine of the ischium (opposite *x*) is first felt for through the fascia and a little above this point the fascia is incised (*op*). The finger then inserted through the opening is pushed upward in the direction of *hook 1* raising a firm fascial band (*m*) constantly present, attaching the rectal sheath to the inner margin of the fourth sacral foramen, the cutting of which gives better access for pulling down from above with the finger the remaining lateral attachment of the rectum (Fig. 5). Along the course of *hook 2* the fascia (*pxn*) is best detached by a downward tearing stroke with the finger, which gives access to the under surface of the paraproctium (*g* Fig. 5). *e*, flap of aponeurotic structure attached to tip of sacrum, originally situated in front of the coccyx from which it was carefully dissected away, before being cut across. Section of this structure was made a little distance below the sacrum so that the sacral vessels which usually lie in it could be readily caught. Here the sacral arteries take an anomalous course. *f*, flap of the tissue covering front of sacrum and containing sacral vessels, from which the bony fragment (Sac Frgt) broken off just below the level of the inferior lateral sacral angles, was elevated for the exposure of the vessels before their severance. *Ne*, nerve from fourth sacral root to posterior fibres of external sphincter, passing between the coccygeus and gluteus maximus muscles, not found in this situation in previous dissections.

ceps, snip it with scissors, and slip the fingers through the opening (Fig. 1 *ab*) into the loose cellular tissue behind, which is then torn free downward to the tip of the sacrum, and laterally out to the internal iliac arteries above and lower down, to the lateral pelvi-rectal attachments (Fig. 2). The sympathetic nerve trunk (Fig. 2) lying in the fascia propria recti on either side can be felt as a cord by the finger hooked beneath each lateral flap of fascia, and avoided. The opening is enlarged downward and outward (Fig. 1 *bc* and Fig. 2 *ad*) on either side, which severs the fascia from its upper and part of its lateral connections and facilitates access to the internal iliac arteries. The latter vessels are directly reached through this space for their ligature if desired, a procedure in technique which was carried out in the case here reported. Also the sacra media artery bound to the sacrum by a thin fascial layer is directly approached for ligature through this space. The director in Fig. 1 indicates the course which the finger takes when pushed laterally just in front of the internal iliac artery. It raises forward the ureter in its sheath closely connected with the peritoneum and appears beneath the peritoneum external to the ureter along the course of the external iliac vein. The finger thus inserted could raise the peritoneum for conveniently incising it along the external iliac vessels for exploration if desired. The separation backward of the fascia propria recti from the lateral pelvi-rectal attachments (Fig. 1 *c*) is not necessary, since if the cleavage (Fig. 2 *k*) in front of the latter be separated out in the first place both layers can be cut together.

The opening of the prerectal space. The two lateral peritoneal incisions are now joined together by one across the base of the bladder which is best made by making taut a fold of peritoneum in the line of proposed incision and then cutting off the crest of the fold with the scissors. This line of incision should be carefully located across the base of the bladder at a distance of not more than half an inch in front of the recto-vesical line of junction. If it be as much as one inch in front of the latter line then the natural cleavage on separating the tissue leads between the bladder and the fascia supporting the seminal vesicles. If the peritoneum be cut over the rectal wall at the bottom of the pouch, then downward cleavage will proceed at first easily, but the longitudinal coat of the rectum will be quickly exposed and is liable to be torn through. The

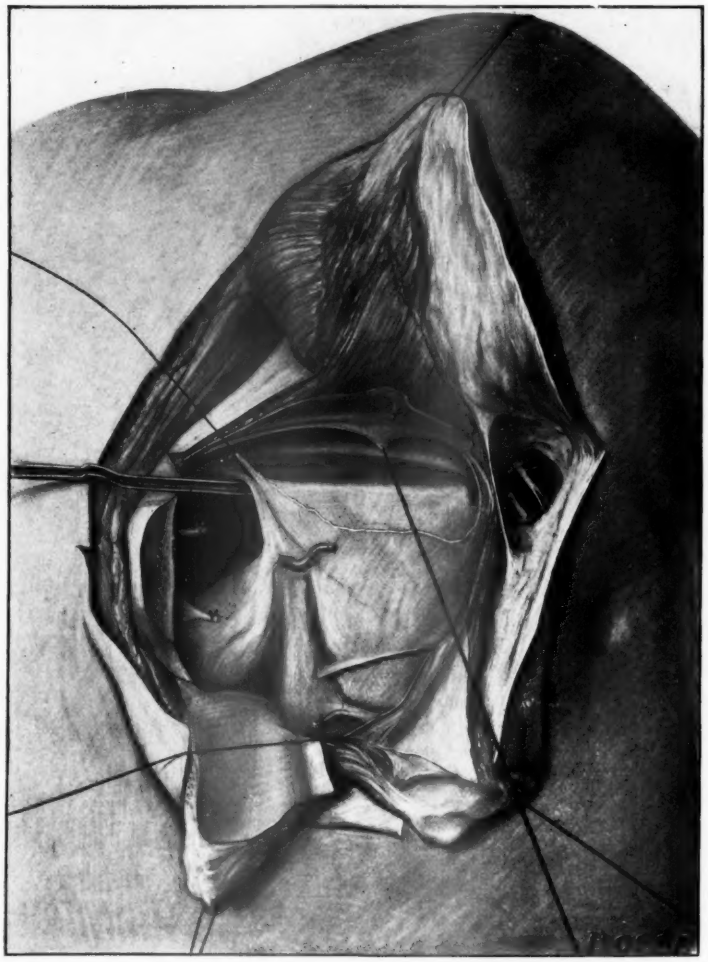

Fig. 5.

prerectal space when opened up presents a complete fascial lining so that when it is definitely entered the front of the rectum is seen to have a fibrous covering. The sure guides to the prerectal space are the vasa deferentia which should be sought for at once on either side through the peritoneal incision, and not until they are located should the attempt be made to cleave between the rectum and bladder. These structures can be readily discerned in the tissues picked up between the thumb and finger if they do not come into view. The proper plane of cleavage lies just behind a layer of fascia covering these structures posteriorly and binding them down onto the base of the bladder. This fascia is usually very thin so that the vasa deferentia are readily seen through it, but in the dissection here shown (Fig. 2) it was so thick as to conceal them entirely from view. By pushing the tissues backward from this fascia along the course of the vas deferens on either side the plane can be exactly entered. There may be a median septum dividing the space in two. To open

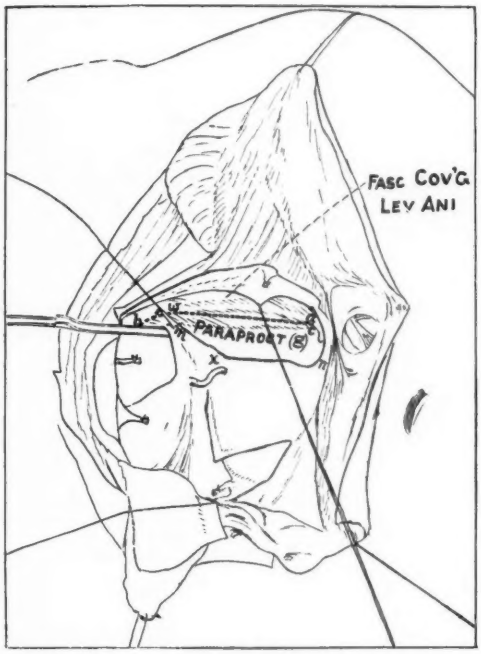

Fig. 5. After detachment of the posterolateral fascial attachment (*mxn* cf. Fig. 4) of the fascia propria recti, the under surface (*g*) of the paraproctium beneath is stripped laterally from the fascia covering the upper surface of the levator ani, as far as to the site (*wa*, highlight in picture) of firm adhesion of these two layers in the neighborhood of the white line. *This gives opportunity for a wide severance (bc) of the paraproctium.* All surrounding restraints having now been removed, the remaining lateral attachments of the rectum, consisting of the paraproctium proper and the fascial lining of the prerectal space (cf. Fig. 2 *director*, and Fig. 8), are easily caught over the finger (course of *director*) through the posterior wound and hooked downward for severance.

this and other planes of cleavage in pelvic work, the well known method of successively placing the extremity of a closed blunt pointed scissors firmly against the tissues to be split asunder and then opening the blades, is most effectual and affords as well a means of determining whether one is working in tissues which can or cannot be stripped from each other. A long trowel retractor is of great assistance in holding the bladder forward.

Dissection of the deep lateral attachments of the rectum and division of the lateral pelvi-rectal attachments from above. The deep lateral attachments of the rectum are very easily separated into their component parts by opening the cleavage *k*, Fig. 2. The use of the long-handled blunt scissors repeatedly pushed closed into the tissues, and withdrawn each time after spreading the blades apart, is of particular value in opening this deep, narrow pocket which extends down to the neighborhood of the fourth sacral foramen. The splitting of the tissues in this plane of cleavage separates off posteriorly a strong lateral attachment of the rectum to the side wall of the pelvis, consisting of firm fascia supporting several sizable sympathetic nerve branches to the bowel, and therefore very unyielding. It is here denominated the lateral pelvi-rectal attachment (Lat P–R Att). It is located in the same plane as the vessel-carrying layer (V B L) passing behind the bowel. Below it joins the fascia propria recti (Fig. 8). Since the line of attachment of this structure takes the general direction of the long axis of the pelvic cavity and its uppermost point is situated at quite a high level above the lower extremity of the sacrum, it can be seen that the cutting of this tough connection by the abdominal route must facilitate the descent and severance through the posterior route (Fig. 5) of those remaining connecting structures which are shown in Fig. 2 raised on the director. The structures raised on the director consist of the paraproctial tissue proper containing when present the middle hæmorrhoidal vessels, and, overlying it in front, the fascia lining the prerectal space. When the lateral pelvi-rectal attachment has been separated back, or cut, then cleavage below the paraproctium is readily gained by blunt force, splitting between the latter structure and the fascia covering the levator ani (cf. Figs. 5 and 8). In the patient in whom the internal iliac arteries had been previously tied, the lateral pelvi-rectal attachments were cut without the occurrence of hæmorrhage. The remaining lateral attachments can either be severed from below as was done on this patient or, as demonstrated in Fig. 8, they may be divided through the abdominal route.

Liberation of the sigmoid colon. The anatomical variations of the sigmoid colon and a special technique for liberating this bowel in each of the three classes of condition found, have been described elsewhere by the writer,

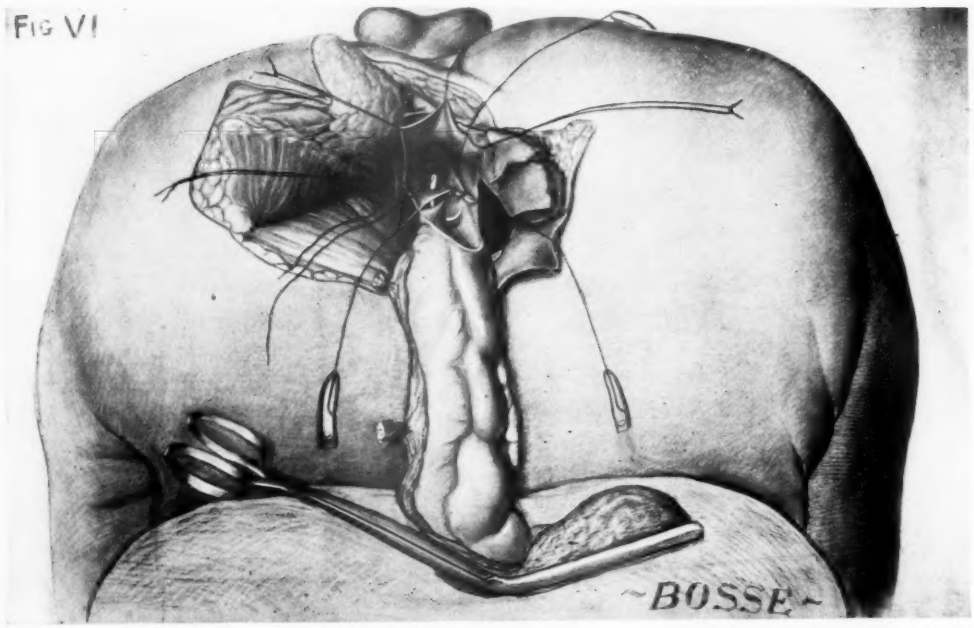

Fig. 6 shows Kraske's position ot dorsal decubitus with vertical elevation of the hips, for suturing the bowel ends, and his method of dividing the proximal bowel by successive cuttings as the sutures are placed. The decided advantages of this position are enumerated on p. 507. In suturing the bowel ends together, first, opposite points of the bowel edges at short intervals were coapted by stitches, the ends of which were left long for traction. As the stitches caught up the edge of the proximal extremity they included the serous coat. Then preparatory to placing the deep stitches, by pulling in opposite directions any two adjacent of these coapting sutures, the intervening mucous edges would be brought evenly together. Under the regulating influence of this traction on the margins, the deep stitches could then be made to include an equal amount of tissue from either segment, and on tying, would maintain in position the even approximation of the edges. The triangular space at the attachment of the mesosigmoid to the bowel was closed by a Maunsell mesenteric stitch. This illustration was the first of the series made, so that a different cadaver was used for this dissection.

(6).[1] The particular points to be here re-emphasized are: That in freeing the sigmoid to bring it down for anastomosis with the distal segment, the vascular arches of the mesosigmoid must be preserved intact in connection with the liberated segment in order to maintain a direct channel of free blood supply to the part; that there are two structures which limit the distance to which the proximal end of the severed sigmoid can be carried, one the entering vessels and the other the peritoneum, and that both must be severed to obtain descent of the bowel; that the peritoneum on both sides of the entering vessels must be first cut before the vessels are tied, so that it shall not be included within the grasp of the ligatures, since, if tied with the vessels, the puckering that results markedly restrains the descent of the bowel; that after the peritoneum on both sides of the entering vessels has been cut and the vascular attachments of the sigmoid stripped up out of the iliac fossa, with traction on the bowel the branches of supply to the arterial arches can be made palpable as cords for their location before ligature; that to effect a low sigmoido-rectal anastomosis without tension, the cut edge of the mesosigmoid containing the vascular arches attached to the freed loop of bowel, must be capable of from five and one-half to six inches descent into the pelvic cavity below the left common iliac vessels.

The technique here shown (Fig. 2) of *cutting the left peritoneal attachment of the bowel to a*

[1] Lusk, *ibid.*

Fig. 7. The writer's posterior approach healed.

point high up in the iliac fossa and then through the opening thus made stripping up out of the fossa from left to right the layer of vascular supply to the bowel, seems to the writer to demonstrate a good principle for general adoption. By pursuing this course the vessels of supply to the sigmoid are exposed up to their origins so that the appropriate branches can be selected for ligature, and as well there is allowed a little additional descent into the pelvis of the proximal bowel. In those cases where the site of attachment of the mesosigmoid lies wholly within the true pelvis and the portion of the sigmoid above in the iliac fossa is more or less closely attached, the division of a peritoneal fold of the left leaf of the mesosigmoid attached to the brim, causing particular restraint to the descent of the bowel, is of much importance. In raising out of the iliac fossa the fascial layer supporting the vessels of supply to the sigmoid, care should be taken not to injure the ureter, which lies in a separate plane of fascia posteriorly.

In the patient the site of attachment of the mesosigmoid was chiefly at the brim and over the psoas muscle. The high cutting of the left peritoneal attachment of the sigmoid was employed. The division of the superior hæmorrhoidal and one sigmoid artery sufficed to gain the proper amount of descent of the bowel. The liberated loop of bowel deprived of the direct blood supply of these two vessels, and with both internal iliac arteries ligatured as well, remained thoroughly vascularized throughout.

Narrowing of the pelvic peritoneal opening of exit for the bowel, from above. Suggested plastic repair of a peritoneal defect in the iliac fossa (Fig. 3). The former step is performed to effect as completely as possible peritoneal closure around the descended bowel at the bottom of the pouch; the latter step is suggested in a case like the one here illustrated where, after liberating the mesosigmoid, a broad surface in the iliac fossa remained uncovered with peritoneum. To narrow the peritoneal opening around the descended bowel, the peritoneal edges cut from the sides of the bowel in the upper part of the pelvic cavity are drawn together (Fig. 3 *hi*). In order to be able to bring these edges together care must be taken when the lateral peritoneal attachments of the bowel in this situation are cut, not to sever them too widely. In the patient, in whom the lines of severance of the lateral peritoneal attachments of the bowel to the parieties gradually converged from below upward until they met at a point up in the iliac fossa, outlining a narrow V, peritoneal closure in the iliac fossa and upper part of the pelvic cavity was easily brought about by simply drawing the serous edges together behind the liberated bowel, which procedure effected a proper covering of the raw surface above, and the desired narrowing of the opening below. In the dissection here illustrated the parietal peritoneal attachments of the sigmoid at the brim and up in the left iliac fossa were set so widely apart that they could not be brought together. It was found, however, that after drawing the liberated bowel down as far as it would descend, the upper portion, lying upon the defect, together with the flap of mesosigmoid attached to it, could be spread out so as to cover the raw surface. This substituted area of peritoneum was in this cadaver sutured into place to suggest a technique for the repair of such a defect.

The abdominal wound is now closed.

The posterior approach. A posterior approach of the writer's device (Fig. 4) was employed, the surgical anatomy of which has already been illustrated (7). The approach proved very efficient for the purposes which it

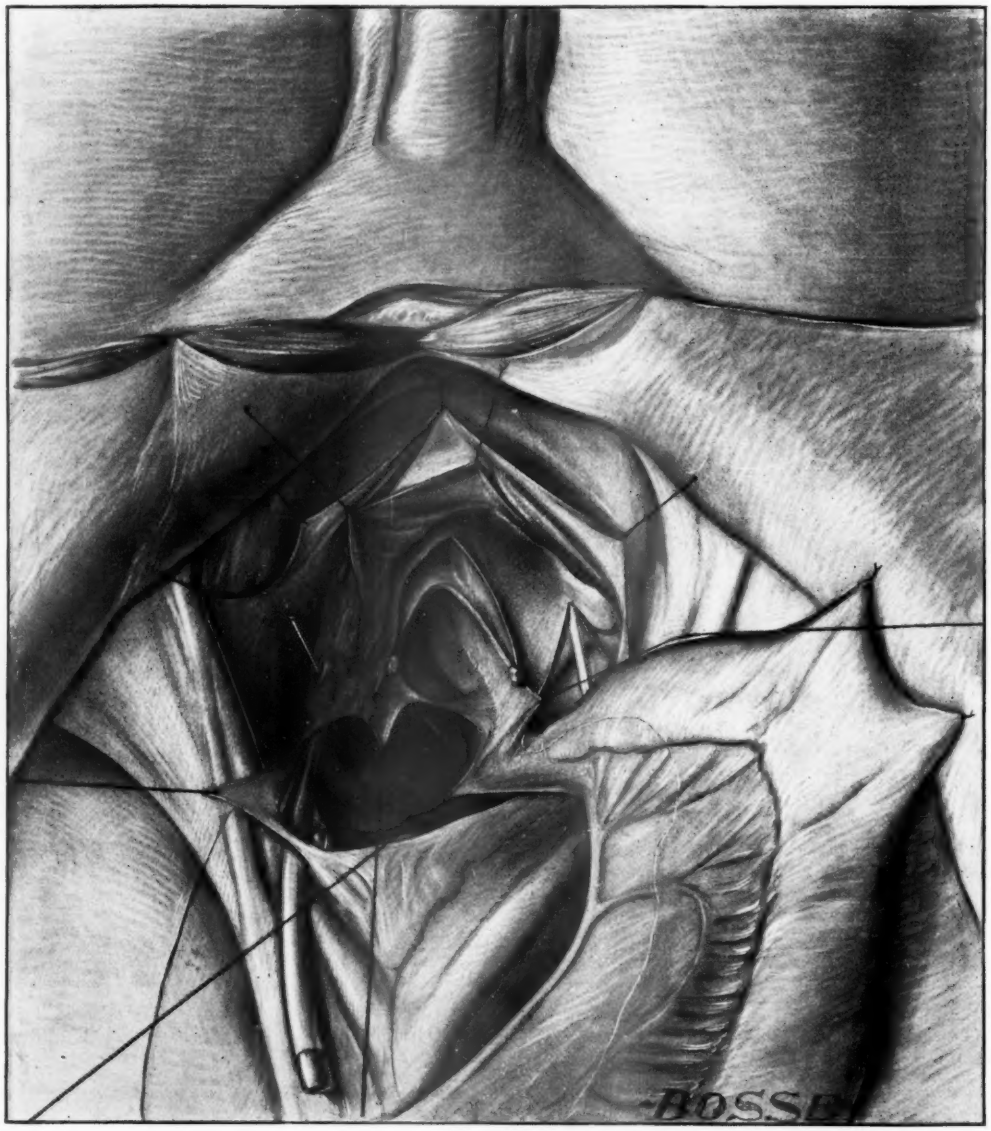

Fig. 8.

immediately subserved, and was entirely satisfactory in its healing (Fig. 7).

The principles of the construction of this approach are the following: A broad instead of a high opening is made. The external sphincter is skirted by the longitudinal incision and thereby preserved intact. Also the inferior hæmorrhoidal nerves in the line of the incision are dissected out and protected from injury. The longitudinal incision dividing

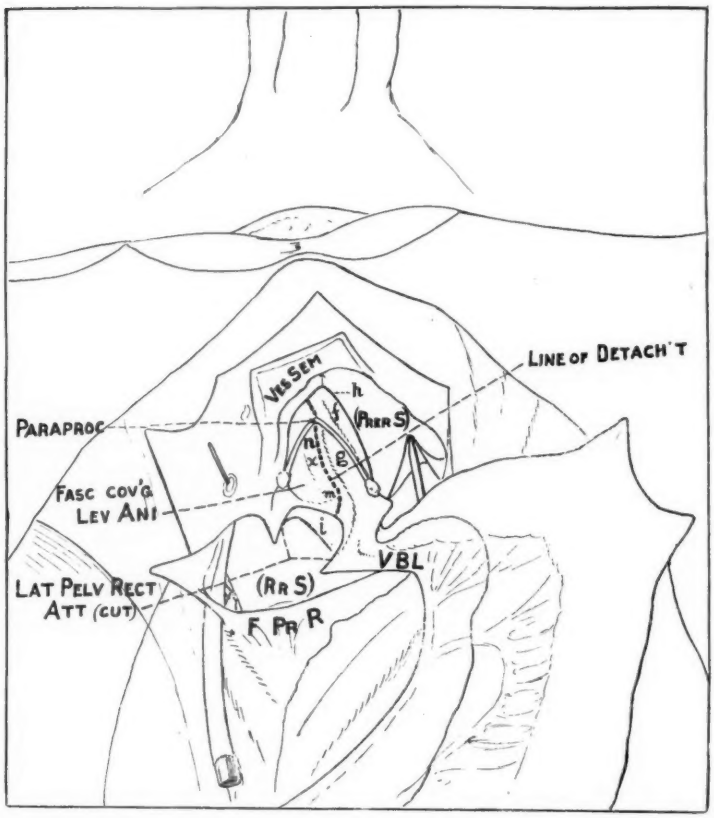

Fig. 8. Deep detachment of the rectum from above. The lateral rectal attachments dissected out in Fig. 2, have been divided. The structure raised on the director in Fig. 2 is here seen to consist of two planes of tissue, one the fascia (*h*) lining the prerectal space, and the other the paraproctium proper (P A R A P R O C). A ligature grasps a portion of the paraproctium at a situation about where the middle hæmorrhoidal artery would be found if present. These two layers diverge from each other in a direction from behind forward forming internally a V-shaped interval (*f*) (cf. *f* Fig. 2), which is occupied by rectal wall overlaid by its fascial covering. The paraproctium is reflected (*g*) (cf. Fig. 5) backward onto the rectum and all of the reflection is removed together with the bowel. *Thus by this technique of detachment the rectum is completely enucleated external to its immediate fibrous and cellular investments.* The posterolateral attachments (*mxn*, cf. *mxn* Figs. 4 and 5) of the fascia propria recti to the fascia covering the levator ani are exposed at the bottom of the space beneath the paraproctium when the latter has been cut, and are readily torn free after having first hooked up over the finger and divided the thickened fibrous band (*m* Fig. 4, raised by *hook 1*) attached to the inner margin of the fourth sacral foramen. (*m* in this picture indicates the situation corresponding to the fibrous band *m* in Fig. 4.) *x* is opposite spine of ischium. The interval *f* is opened downward by blunt separation, and between the space thus created and that behind the prostate, there is brought out for severance a plane of tissue (in the same plane as the *arrow*) attached along the outer edge of the prostate. *i*, fascia covering third and fourth sacral nerve branches to pelvic plexus of sympathetic.

the levator ani passes to one side of the median line, thus avoiding implication with the dense median aponeurosis joining the two levatores ani, and terminates alongside of the anus, thereby opening down to a very low point. The unyielding median structures below the sacrococcygeal joint are turned aside in one flap which removes entirely their restraining influence on retraction of the wound, and furnishes a firm line of support in its subsequent healing.

The technique of constructing the posterior

approach is as follows: With the patient on the left side an incision is made in the median line from the fourth sacral vertebra to the upper part of the coccyx, then it turns diagonally over the right edge of the coccyx and enters the fat of the ischiorectal fossa, after which it is continued superficially downward and a little to the right, to terminate at a point an inch or more lateral to the posterior margin of the anal canal, which point is about over the site of entrance of the inferior hæmorrhoidal nerve branches into the external sphincter. To avoid injury to these nerves, the anal fascia is first exposed in the angle just below the tip of the coccyx between the external sphincter and gluteous maximus muscles, then the finger pushed along the anal fascia, in the line of the skin incision, raises off the overlying fat of the ischiorectal fossa. At the forward part of the cleavage thus effected, just about lateral to the posterior margin of the anal opening, there is usually included in the raised tissues the inferior hæmorrhoidal nerves, which, when thus elevated, can be felt cordlike over the finger and are readily dissected out. The finger may however pass below these nerves not including them in the raised layer of fat, in which event they will be found lying in a little fascia on the surfaces of the levator ani and external sphincter, where they can be made prominent for dissection by downward traction on the latter muscle. The gluteus maximus is now cut from the right edge of the coccyx, and the coccyx is disarticulated and dissected from the firm structure adherent to its anterior surface and swung over to the left, to which side it is left attached. The dissection of the tissue from the anterior surface of the coccyx should be made very close to the bone to avoid injury to the terminal sacral vessels which occupy the texture of the precoccygeal structure. In the patient there was some bleeding at this juncture from wounding of these vessels, but it was soon controlled after the coccyx had been reflected, when the underlying structure incised laterally for the passage in front of it of one blade of a clamp, could be securely caught. The precoccygeal structure is now incised all the way along its right edge, the incision passing as well through a thin underlying layer of fascia to enter a fascial compartment of which the fascia propria recti (F P R) forms the anterior boundary. The finger is then made to enter this compartment pushing its way in an upward direction in front of the resistant structure of the lesser sacrosciatic ligament up to the level of the fourth sacral foramen, and in a downward direction above the right levator ani raising it for severance to the bottom of the compartment. The latter tissues are first cut, and below the limit of the compartment the division of the levator ani is continued forward lateral to the anal canal to a point about opposite its posterior margin, avoiding the previously located inferior hæmorrhoidal nerves. The deep longitudinal incision is now extended upward along the right side of the fifth sacral vertebra until the lower border of the inferior lateral sacral angle is reached, dividing in its course all of the attached structures, which are, the gluteus maximus muscle, the lesser sacrosciatic ligament, and the coccygeus muscle. When this deep longitudinal incision has been completed the precoccygeal tissue is cut transversely across about half an inch below the tip of the sacrum, leaving this flap (*e*, Fig. 4) on the sacral side thus long for clamping the sacral vessels lying in it. A cross incision (*lq l'*) is now made on the left side starting opposite the sacrococcygeal joint and passing outward and a little downward in the direction of the gluteus maximus fibres, which splits the latter muscle and severs the coccygeus muscle beneath it together with its underlying fascia, to a wide point. In this dissection a large nerve (N E) lying between the gluteus maximus and coccygeus muscles, arising from the fourth anterior sacral root and going to supply the posterior fibres of the external sphincter, was discovered, the like of which had not been found in any previous dissection. So that a nerve should always be looked for at this situation. Thus is formed a right-angled flap containing the unyielding postanal median line structures severed from their upper connections, by which construction the restraint exercised by these structures on retraction of the wound is completely relieved. These median structures are connected anteriorly to the fascia propria recti by a septum (M S) which should be hooked up over the finger passed to the left of it from above downward,

and cut, in order to get free access to the fascial compartment of the left side.

The right lateral flap is now completed as follows: A skin incision (*vy*) is first made from the upper limit of the longitudinal skin incision, outward and a little downward in the direction of the gluteus maximus muscle fibres. The latter are then split outward in the same line and dissected off from the great sacro-sciatic ligament as it is met. As this muscle is cut from the lower border of the latter ligament, the coccygeus muscle pulls into view emerging from beneath the deep surface of the ligament, and should be divided close to its lower edge.

The fascial compartments of the two sides, situated postero-laterally to the rectum, entered by the above approach, are now opened up laterally by blunt separation, out to the pelvic attachments of the fascia propria recti (*mxn*), and the retrorectal space primarily opened up from above, is now entered from below by upward pressure directed against the anterior surface of the bodies of the sacral vertebræ, which strips the fascia propria recti forward. This latter manipulation in the patient was attended with considerable hæmorrhage which eventually became arrested spontaneously. If more room be needed for detaching the remaining connections, as it was in this patient, the lower extremity of the sacrum below the level of the inferior lateral sacral angles is sectioned. The division of the bone is best effected with an osteotome directed transversely, which cracks the bone across without lacerating the anteriorly attached soft parts (*f*) in which the vessels lie. The fractured fragment can then be pried up sufficiently for the vessels to be dissected out and clamped before they are divided. Simple reflection of this fragment to the left gave all the room that was required in the operation on this patient, but even wider access may be secured by continuing the division of the deep structures laterally on the left side in the same manner as was practiced on the right. At the close of the operation this bony fragment was removed, but the coccyx was left.

Completion of the detachment of the rectum through the posterior approach. When the fascia propria recti has been stripped forward from the anterior surfaces of the bodies of the sacral vertebræ from below up to where communication is established with that portion of the cavity of the retrorectal space previously opened by the abdominal route, then before hooking down the paraproctial attachments of the rectum with the finger for their severance, a little more freedom for the manipulation of these structures can first be gained by detaching the underlying lateral pelvic attachments (Fig. 4 *mxn*) of the fascia propria recti. To do this an opening *op*, Fig. 4, is first made through the latter fascia just above the spine of the ischium (*x*). Then the finger, introduced through this opening, pushed in an upward direction (hook 1) raises the firm fibrous band *m* attaching the rectal sheath to the inner margin of the fourth sacral foramen, which should be cut, and pushed in a downward direction (hook 2) directly against the lower portion (*pxn*) of the line of attachment of this fascia, strips the latter free (cf. Fig. 5). The band *m* is invariably present and with its severance considerable lateral relaxation is obtained. With the detachment of this lateral fascial attachment (*mxn*), the under surface of the paraproctium (Fig. 5 *g*) is directly reached, which should now be stripped laterally in an upward direction from off the fascia covering the levater ani, to the site (*wa*) of its firmer adhesion to the latter fascia about three-quarters of an inch above, in the neighborhood of the white line. The paraproctium now drawn down by the finger hooked above it in the course of the director (Fig. 5), can be cut widely (*bc*) from the bowel. The line of section can be made a good half inch wider than that line in the illustration corresponding to the fold where the tissues lie across the director. In operating on this patient in whom the internal iliac arteries had been ligatured, on severing the lateral attachments on the two sides there was but one bleeding point that required ligature.

Division and suture of the bowel ends in the Kraske position. The loop of liberated intestine is drawn out through the posterior wound before it is divided, as practiced by Rotter (8).

Before opening into the bowel the pelvic peritoneal opening is first closed off from below

with gauze, as practiced by Kraske (9). A strip of plain and a strip of iodoform gauze were here passed upward deep into the pelvis along either side of the descended bewel for this purpose. For the carrying out of the steps of actual resection of the diseased segment of bowel now to be performed, the patient is put in the position instituted by Kraske, of dorsal decubitus with vertical elevation of the hips and with thighs flexed acutely over the abdomen (Fig. 6). The position is maintained by a high substantial sandbag supporting the back and an assistant on either side to hold the lower extremities. The bowel was freed evenly around its circumference down to a level a little distance above the internal sphincter, just proximal to which site it was clamped and severed below the clamp, leaving but a very short margin of the distal segment detached from its peripheral connections which give it nourishment and support. In the patient the distal end bled freely on severance, showing that its nutrition was maintained notwithstanding the ligature of the internal iliac arteries. Following Kraske's technique in sacral resection the edge of the anal segment of bowel as it was cut across was caught at intervals with silk threads to serve as holders. Also the method of severance of the gut above the tumor was in imitation of Kraske's technique in sacral resection. This severance was commenced by interrupted cuttings beginning anteriorly, after each of which the margin of proximal extremity thus liberated was united at once to the distal piece, but as soon as enough stitches had been placed to widely support the proximal end, then the completion of the severance was effected all at once. By this method the portion of bowel to be removed is used as a handle until the proximal end is well supported by the stitches.

In *suturing the bowel ends together* particular care was taken to bring and hold evenly together the mucous edges of the approximated bowel ends, which was done as follows (Fig. 6): First, opposite points of the bowel edges at short intervals were coapted by stitches, the ends of which were left long for traction. As the stitches caught up the edge of the proximal extremity, they included the serous coat. Then preparatory to placing the deep stitches, by pulling in opposite direction any two adjacent of these coapting sutures, the intervening mucous edges would be brought evenly together. Under the regulating influence of this traction on the margins, the deep stitches could then be made to include an equal amount of tissue from either segment, and on tying, would maintain in position the even approximation of the edges. Particular attention was given to making the deep stitches bring together broad phalanges of tissue. Kraske has stated that the edges of the mucous membranes should be carefully coapted in the intervals between the deeper stitches. As many of the stitches as possible were placed from within the bowel where they could be tied on the inside. Where the triangular space at the attachment of the mesosigmoid to the bowel came into the line of anastomosis, which was at the posterior median line, it was closed by a Maunsell mesenteric stitch. This was the last stitch that was tied inside, and there now remained unsutured an opening about one centimeter long on either side of this central stitch, which area was closed in by two rows of continuous number one chromic gut sutures placed on the outside of the bowel. All of the inside sutures were of stout iron-dyed silk and were put in place by means of a good sized, full curved, round needle. The stitch line should efficiently coapt the surfaces to prevent primary leakage. Rotter (10) enjoins that for the prevention of fæcal wound infection it is of great importance that the bowel stitches should be tied without tension.

Kraske's position of the body for sigmoido-rectal anastomosis (Fig. 6) seems to be the perfect one. It places the posterior wound in the line of vision of the seated operator so that he does not have to bend his back or crane his neck in order to see what he is doing. By making the position of the proximal extremity of bowel one of suspension as it were in mid air, the danger of infection is diminished since the open end can then neither trail on the wound nor discharge any contents by gravity. This position also causes the unsutured portions of the bowel edges to be held vertically apart by gravity, thereby giving good access for placing those sutures introduced from within the bowel. The vertical elevation of the hips must also aid in determining the proper length to cut

the proximal extremity so that it can be sutured to the distal segment without tension, since in this position the parietal vascular connections of the bowel would tend to sag upward, thereby becoming distanced from the suture line to a maximum degree.

In the patient, after estimating a proper amount of proximal segment to leave, the bowel was divided one inch below the estimated level. As the freed mesosigmoid was cut across in the line of severance of the bowel, the divided arterial arch spurted forcibly so that there was no question as to the good nourishment of the freed bowel. The site of division of the bowel above the tumor was made just above the site of the ligature of the superior hæmorrhoidal vessels, about opposite the promontory.

Besides the gauze strips earlier passed upward into the pelvic cavity along either side of the descended bowel, there was now placed a narrow strip of iodoform gauze across either side of the bowel, on the right side a little above the suture line, and on the left side directly over the suture line. Also to protect the pelvic cavity from liability of infection a gauze pack was interposed between the descended bowel and the sacrum for a distance of about an inch above the divided extremity of the bone, and then to keep the central wound open for drainage, gauze was laid between its edges along the posterior surface of the bowel. The fragment of sacrum was removed. The lateral muscular cuts were sewed together with chromic gut and the corresponding skin wounds with silkworm gut. The lower angle of the skin incision to the right of the anus was drawn together by two stitches. Tube laid in anal canal through stretched sphincters.

THE CASE HERE REPORTED

History. The patient, male, age 55, engineer, was admitted to St. Vincent's Hospital, September, 1908. Had had pain over sacrum and lower abdomen for about eight months. Blood and pus first noticed in stools in August. Had lost thirty pounds in weight. Examination showed a movable tumor at the upper part of the rectum, presenting the appearances of cancer. Microscopic diagnosis; malignant adenoma. Blood examination; red count 5,238,000, hæmoglobin 90 per cent.

Operation. September 30, 1908, as above described. The bowels had been very thoroughly emptied and the administration of deodorized tincture of opium begun prior to operation. The patient preserved a slow and steady pulse of about 90 throughout the entire operation.

Post-operative course. Uneventful excepting for the formation of a small half inch long fistula on the left side following the withdrawal of the iodoform gauze drain placed along the suture line on this side, after the bowels had been moved. These lateral gauze drains across the bowel had up to this time stuck so persistently to the tissues that they could not be dislodged and even finally they had to be removed with some force. The posteriorly situated gauze had been gradually removed soon after operation, and on the seventh day, under gas, the long strips up in the pelvis along the bowel were taken out. The bowels were moved on the ninth day. Bowel irrigated daily for several days prior to movement, through tube in anal canal with oil and with water in small quantities for cleansing. Highest post-operative temperature 99.8 by mouth, was on the day following operation. Seventeenth day patient up in wheel-chair.

The fistula closed rapidly. By the middle of the eighth week there was leakage only of a little wind once in a while, and by the end of the tenth week the opening had entirely closed. The posterior wound collapsed rapidly and healed solidly.

Pathological report. Sections of the specimen, made at a number of situations, extending from the periphery into the cancerous territory, failed to disclose an area where the freeing of the bowel had not been made well clear of the disease.

Result. The patient six weeks after the operation weighed one hundred and twenty-seven pounds. In the subsequent four weeks he gained eighteen pounds and later put on fifteen pounds more. He in no way feels different from his former normal condition of body, and rejoices in the fact that in re-establishing his claim to life, a pair of perfectly functionating sphincters can still be enumerated among his worldly possessions. The result of the healing of the posterior wound is shown in Fig. 7. There is no weakness of the pelvic floor. There is no stricture of the bowel at the seat of anastomosis, the cicatrix along the line of union of the bowel edges anteriorly presenting a raised ridge about one-quarter of an inch high, and posteriorly being no more than just palpable. At the present writing, August, 1909, the patient is in excellent health and has no recurrence.

A TECHNIQUE OF PERIPHERAL DETACHMENT OF THE MALE RECTUM ENTIRELY BY THE ABDOMINAL ROUTE

By dissecting the deep lateral attachments of the rectum as shown in Fig. 2, and severing them as indicated in Fig. 8, wide enucleation of the rectum entirely peripheral to its cellular and fascial investments can be accomplished by the abdominal route. The prerectal fascia (*h*) overlying the paraproctium should first be

raised by a blunt curved scissors and severed, after which the paraproctial layer isolates with ease. The complete peripheral detachment of the male rectum by the abdominal route would seem to be indicated in all cases of high seated cancer where the sphincters can be saved. Thus where resection is to be performed with circular suture of the bowel ends through a posterior approach, after having primarily freed the entire rectum from above, the posterior approach, generally speaking, need not then be of such large dimensions as where a high reach from below were necessary for the detachment of the bowel. Also in these cases, where resection is contraindicated, the rectum after peripheral freeing from above, could then be tied off and severed with a cautery just above the pelvic floor, through the same approach, a posterior slit made alongside the coccyx for drainage, the peritoneum closed above, and an inguinal anus established. By such a course the operation of excision of the rectum would be expedited by its completion through the one approach, and with the anus left in situ there would be no weakening of the pelvic floor. The rectum has been resected entirely by the abdominal route by a number of operators, using variously the invagination method, and circular suture from within the abdominal cavity, for uniting the bowel ends. Three reported cases of implantation of the sigmoid into the denuded anal canal attempted by the abdominal route were unsuccessful. (See Lusk, ibid.)

THE CONTROL OF HÆMORRHAGE

In the patient here reported in whom the superior hæmorrhoidal and one sigmoid arteries were tied and Giordano's (11) technique of preliminary ligature of the internal iliac arteries was carried out, there was no loss of blood during that portion of the operation performed by the abdominal route, but in the construction of the posterior route there was some hæmorrhage and in the stripping forward of the fascia propria recti from the lower part of the front of the sacrum through the same route, there was considerable bleeding. Since all the channels of direct blood supply to the region of the posterior approach with the exception of the sacra media artery had been tied off and yet there was this considerable hæmorrhage, especially from the median line area in front of the coccyx and lower sacrum, it would seem advisable to recommend as well the ligature of the sacra media artery by the abdominal route. In one cadaver a sacra media artery was found passing from the lower portion of the front of the sacrum forward onto the rectum, which anomaly if met in detaching a rectum must surely lead to unexpected hæmorrhage up in the sacral hollow, unless the vessels have been previously tied. The Mayos (12) practice ligature of the sacra media artery by the abdominal route.

The ligature of the internal iliac arteries was practiced in this case with the idea of reducing the blood loss to a minimum and in the hope that as a result there would be little bleeding in the construction of the posterior approach. The hope however as already seen, was not realized. The ligature of the internal iliac arteries cuts off directly from the field of operation blood supply from the middle hæmorrhoidal arteries when present, and from the lateral sacrals, gluteals, and internal pudics. Whether, in the patient, the source of most of the hæmorrhage experienced, was from the sacra media artery or whether collaterals were large contributors is a matter for speculation. In performing the perineal portion of the operation of abdomino-perineal amputation of the rectum, the preliminary ligature of the interna iliac arteries affords complete hæmostasis in this otherwise bloody field, a fact emphasized by Quénu. In the interest of good nutrition of the anal segment of bowel Kraske advises against ligature of the internal iliacs in resection of the rectum. In this patient, however, at the site where the bowel was severed below the disease, the cut end of the distal segment bled freely, demonstrating that in this one case at least, its nutrition had not been impaired by shutting off its direct supply of blood. A single instance however proves nothing.

THE STATED OBJECTIONS TO RESECTION

The advantages of restoring the continuity of the intestinal track following extirpation of the rectum, for the purpose of securing normal bowel control by the physiological sphincters, are unquestioned. That the task is perfectly possible of accomplishment under

certain conditions, literature abounds in proofs. The generally stated objections to the operation of resection by those surgeons who do not practice it are: the liability of the bowel end to slough, the giving way of sutures and formation of fistulæ, the danger of infection, paralysis of the sphincters as a result of operation, and secondary stricture formation.

The above objections to resection will be considered in order and the technique of the case here reported will be referred to where it might add its influence in the quest for correct principles of sigmoido-rectal anastomosis.

It is an already established principle that no case is suitable for resection unless the proximal segment can be liberated together with its vascular supply, to a sufficient extent for its extremity to be brought without tension into apposition with the distal segment. (See Liberation of the Sigmoid Colon, p. 501.) A proper liberation of the sigmoid in a way to preserve the nutrition of the bowel requires a technique that should be carried out with the utmost care and precision. When one considers the great variation in the anatomical conditions affecting the sigmoid flexure as regards the length of the loop, the site of attachment of the mesosigmoid, and the arrangement of its vascular supply (see Lusk, ibid.), it would seem obvious that the proposition of liberating a sigmoid loop through a posterior route of approach cannot always be possible of execution, and that in those cases where it is found to be possible, the necessary manipulations being performed high up in the pelvic cavity, must be carried out mainly under the guidance of the sense of touch. Compare the limitations and uncertainties of liberation of the sigmoid under these circumstances with the greater perfection of technique, which can be carried out in open view through the abdominal approach as here illustrated, and then decide impartially as to the better method of the two. The use of the abdominal route for the employment of an exact technique in the liberation of the sigmoid flexure must certainly increase the percentage of cases on whom it may be possible to perform resection. In the cadaver used for the illustrations of this article, the sigmoid flexure lying mostly in the left iliac fossa, and held closely attached to the fossa and folded upon itself in loops (Fig. 1) by a short left peritoneal attachment, could never have been spread out and its vessels ligatured at the proper places for preserving the nutrition had the attempt been made through a posterior approach. Kraske (13) has said that in rectal resection where he has used the abdominal route for the mobilization of the bowel above the tumor, he has most always seen a primary union of the sutured ends occur. In the case here reported in which the sigmoid was liberated by the technique herein described, when the arterial arch was cut in the line of section of the bowel, it spurted forcibly, thus dispelling all doubt as to the maintenance of nutrition of the part. Archibald (14) has pointed out another principle applicable to securing a well nourished proximal extremity of bowel in rectal resection, and that is, that the sigmoid should be divided above the segment of bowel corresponding to the meeting place of the distributions of the lower sigmoid and upper superior hæmorrhoidal branches, since the arteries of supply to this segment anastomose but little and therefore this piece of bowel when freed is poorly nourished and would be liable to necrose if retained. Rotter (15) likewise has observed in this connection that the upper end of the rectum cut from its blood supply by the ligation of the superior hæmorrhoidal artery, becomes gangrenous far more easily than does the flexure to which a broad mesentery with its vascular anastomotic arches brings a much better nourishment.

The formation of a fistula following a rectal resection should not be an occurrence to be dreaded. It is a frequent sequel of this operation. The fistula is situated posteriorly and usually closes spontaneously in a longer or shorter time. If the bowel ends are efficiently coapted by a suture line going all the way around as seems to be the best practice, then primary leakage is prevented, and the secondary leakage which is usual, occurs several days after the operation at a time when the wound has begun to granulate and the danger of septic infection is past. Lieblein has advanced the latter conclusion. The writer is of the opinion based on his observations of the union around the gut in artificial ani, that the apposition of a serous with a non-serous tissue gives a quickly

formed firm adhesion, and believes that herein lies one principle in making the anastomosis, which is that the proximal end should be entirely surrounded with peritoneum. In the case here presented care was taken to close with a Maunsell mesenteric border stitch tied on the inside of the bowel, the triangular space at the site of attachment of the mesosigmoid to the bowel. By this procedure a complete circle of peritoneal surface on the proximal segment was brought into apposition with the non-serous periphery of the distal segment. The situation of this Maunsell stitch was directly in the posterior median line. Broad surfaces of the two bowel ends were sewed in contact, about half to three-quarters of an inch of the periphery of each segment being coapted in conformity with what would seem to be another correct principle in performing this anastomosis. The writer inclines to believe that drainage directly over the suture line may be a bad principle of action. The two iodoform gauze drains laid transversely across the bowel one on either side, both adhered tightly to the wound up to the time of their removal soon after the moving of the bowels which was done on the ninth day, and even then there was need of some slight force to withdraw them. The tissues above and below each drain had healed solidly, so that on the side where the drain had been placed above the suture line the latter was well fortified by a firm adhesion uniting it with the lateral tissues,while on the side where the drain had been placed directly along the suture line the fistula developed after removal of the drain. Up to the time of removing the drain there had been no leakage whatever, and the question is consequently invited whether, if the suture line on this side too had been permitted to come into contact with the lateral structures, leakage would have occurred at all. Directly across the middle line posteriorly where no gauze had adhered, the union between the bowel ends was solid. Thus it would seem that if the gauze drain for the protection of the suture line of the anastomosis were laid across the bowel at a little higher level than the suture line instead of directly over it, it would then be removed from a situation where it might interfere with union, and at the same time would afford a channel sufficiently near the seat of anastomosis for drainage in case infection should take place.

In resecting the rectum by the combined method, by the employment of Rotter's technique of cutting out the diseased segment through the posterior approach after having closed off the peritoneal cavity, the liability of infection of the latter must be practically nil; and by employing Kraske's elevated hip position for suture of the bowel ends, which with the first apposing stitch causes the open proximal end of intestine to be suspended in mid air away from the possibility of its dragging over the wound, together with the use of his method of division of the bowel above the disease by interrupted cuttings as the sutures are placed in position, the danger of infecting the posterior wound is a minimum one and with suitable drainage ought practically to be under control. This presupposes that the bowels have had a very thorough emptying and then been constipated prior to operation. Rotter, Czerny, Kocher, Mikulicz, Krönlein, Hochenegg, stitch the pelvic peritoneal flap around the descended bowel for protection against peritonitis, while Kraske closes the opening simply with a tamponade. Kraske says that after insertion of the latter if inspection be made from above one can see no surface which is not covered by peritoneum. Kraske (16) in another writing, in relation to his practice of cutting the rectum across below the tumor before freeing it, mentions a series of 120 cases of rectum extirpations on the great majority of which he had performed resection and not one had had either a phlegmon or peritonitis. The suture of the peritoneal flap around the descended bowel through the posterior wound is not very easy of performance even with Czerny's traction sutures with which to pull down the peritoneal flap, so that instead of performing this time-consuming procedure, in the light of Kraske's experience the writer chose to use the tampon, adding to the technique the narrowing of the pelvic peritoneal opening through the abdominal approach as shown in Fig. 3 (*hi*).

Paralysis of the sphincters following rectal resection is quite unnecessary if the proper means be employed to avoid injury to the internal pudic nerves and the sphincters themselves be

not divided. Kraske sacrifices the fourth sacral nerve root of one side in his sacral approach, without impairment of the sphincter function. He disapproves of the promiscuous practice of transverse division of the sacrum below both third foramina. By the employment of the abdominal route for primary procedure in extirpating the rectum, it would seem that any further necessity for performing extensive sections of the sacrum which mutilate the nerves, for the purpose of gaining a high reach from behind up into the pelvic cavity, could be quite obviated. In constructing the posterior approach employed in this case, care was taken to preserve the right inferior hæmorrhoidal nerve distribution which was easily done as above outlined. The technique of this operation likewise divides only those sympathetic nerve branches which directly supply the rectum.

A serious strictured condition following resection of the rectum may be chargeable to sloughing of the bowel ends which should be guarded against by applying the principles of preserving good nourishment in the intestinal segments. The proximal bowel end has been known to have sloughed with great frequency. De Quervain (17) believed that the distal end sloughed in a case of gangrene at the seat of anastomosis in which he had sutured the transverse colon to the rectal segment by Hochenegg's invagination method.

Weir (18) has reported 2 cases of sigmoido-rectal anastomosis by the invagination method done through the abdominal route alone, in whom it became necessary a few weeks after operation to use a number seven or eight Wales bougie. Tixier (19) recently reports a severe stricture following recto-sigmoidal anastomosis by Hochenegg's invagination method requiring a subsequent operation for its removal. In the performance of the invagination method the extremity of the distal intestine must be dissected out free so as to form a cuff of a sufficient length to be inverted and drawn down through the anal canal. An impaired blood supply to the cuff of bowel freed from its peripheral connections would suggest one reason for stricture following this method of resection. It would seem as though a strictured condition following this operation could also be rendered liable in another way. The writer is of the opinion that if the cut margin of the distal segment be stripped but little out of its surrounding tissues, the latter maintain the edge of this piece of bowel in a wide circle conforming to the circumference of the rectal ampulla, which will splint the line of suture, whereas if much of a cuff be freed at the distal end as must be done in the invagination method of resection, the line of suture is then collapsible and must be more subject to the influences of pressure and scar contraction. In the case here reported there was no stricture at all at the line of union of the bowel ends, the scar being little more than just perceptible to the palpating finger, which result was undoubtedly due in part to the accuracy of coapting the edges of mucous membrane, and likely as well to some extent to the maintenance in a wide circular outline of the edge of the distal segment by the peripherally supporting tissues.

To the writer the greatest and most real objection which he can see to the operation of rectal resection is the added length of time needed in its performance beyond that for the simpler but yet protracted operation of excision with the establishment of an inguinal anus. The only way to meet such a serious objection is by improvement of the technique, particularly along the line of the control of hæmorrhage. Besides, a thorough knowledge of the anatomy, training of the sense of touch, practice on the cadaver, and training of those who are to assist at the operation, are important elements in reducing the length of time expenditure.

THE NECESSITY FOR THE ABDOMINAL APPROACH

In resection of the rectum the abdominal route permits of one particular feature in technique which can never be carried out through a posterior approach, and that is the liberation of the sigmoid in plain view. Enough has already been said to impress the importance of employing a correct technique in the procedure of sigmoid liberation, which one can rely upon attaining only when the sigmoid is approached from above. Hence it must be concluded that in cases where a high division of the bowel is aimed at with descent of the sig-

moid for anastomosis, the posterior route alone is inadequate to meet with the greatest efficiency the operative conditions.

By the primary use of the abdominal route in contemplated rectal resection, the anatomical conditions affecting the sigmoid can be determined and the decision reached, at the outset, as to whether resection be possible of execution or whether an inguinal anus must be established. Should the sigmoid prove of insufficient length to reach the anus after liberation, or the patient's condition not warrant a protracted operation, and the establishment of an inguinal anus be therefore necessary, then the complete enucleation of the rectum down to the anus, and its removal can be accomplished from above in the manner here indicated (Fig. 8, and page 505), without resort to the posterior route. Another fact bespeaking technical correctness in approaching rectal cancer by the abdominal route, is the ease with which the rectal attachments can be dissected through this approach in a way to permit of their wide severance well outside the cellular and fascial investments of the bowel (Figs. 5 and 8). Further advantages of the primary use of the abdominal route — palpation of the liver for metastases, determination of the extent of the disease at the beginning of the operation, high division of the bowel and its associated lymphatics, the control of hæmorrhage, the avoidance of mutilating sections of the sacrum, the avoidance of the sacral anus — are all emphasized in literature and add force to a proposition that this route is *necessary* for the carrying out of the most perfect technique not only in resection, but also in any operation for the removal of rectal cancer.

THE SAVING OR REMOVAL OF HEALTHY SPHINCTERS

The value to a man of saving his healthy sphincters speaks for itself. Has not scientific surgery of to-day reached a stage where it *can* and *should* aim to obviate that distressing ill of humanity, the incompletely controllable or uncontrollable anus? Are not the possibilities involved in this problem worthy of much thoughtful study and work?

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POST-OPERATIVE PSYCHOSES[1]

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A SURGICAL operation, always in itself a tragedy, ought by rights in compensation and in accord with all natural human calculation and expectation, to usher in without delay an era of comfort and of good health. Happy is he who attains this goal, a goal, sad to say, not always reached. The tragedy deepens when health refuses to enter the door, as in the case of an operation not removing existing trouble, when an ineradicable malignant growth exists. The gloom persists also when, as a result of the operation, new discomforts and dangers arise from serious disturbances in the healing process; when there is any profound and lasting disturbance in the nervous system, or when by that frightful and unforeseeable complication, thrombosis and embolism, the fruits of our labor are suddenly snatched away.

My purpose this afternoon is to deal with some of these unwelcome sequelæ, namely, post-operative psychoses, their frequency, cause, variety, seriousness, and finally to inquire how they are best treated or prevented.

Considering its importance, this group of post-operative complications has received scant attention at the hands of our surgeons. In the quarter of a century just elapsed, papers have appeared sporadically and these for the most part fragmentary, in this country and abroad, merely reporting a case or two. This neglect is perhaps due to the fact that such a consideration carries the surgeon into an obscure and alien domain with which he has no technical familiarity, one whose very terms are puzzling.

Unable to deal with more than one phase of the subject, I have appended in my bibliography a list of the most important contributions. Those of Werth (1) before the German Surgical Society at Halle in May, 1888, of our own J. M. Baldy (5) before this Society in Washington in 1891, and Picqué (8) at the French Surgical Society in March, 1898, are extensive discussions, and especially valuable, as also the papers of Hurd (15), Engelhardt (13) and Selberg (14).

Although often adverting to the fact that surgical operations are sometimes provocative of insanity, alienists themselves have, as a matter of fact, paid small attention to a subject so peculiarly their own province. In addition to Dr. Hurd's paper, the best treatment from the psychiatric side is found in the discussion at the French Congress of Alienists at Angers in 1898. It is a notable fact that the text-books on Surgery and Psychiatry often dismiss the subject with but a word or no mention at all.

One is struck at once in scanning the literature by the diversity of views held regarding almost every phase of the subject. In the first place to what class shall the term post-operative insanity be applied? Hurd (15) would limit the cases to those clearly the result of infective processes; Selberg (14), in addition to infection, reckons some cases as due to anæsthesia, some to drugs, some to auto-intoxication, some to physical and others to mental exhaustions; Picqué (8) eliminates those cases due to alcohol, drug intoxications, septic infections, and employs the term only to designate those instances where the trouble supervenes in a patient not otherwise ailing, without fever and without any demonstrable form of intoxication. Regis (11) divides his cases into these three groups:

1. Those coming on immediately after operation, due to anæsthesia and shock.

2. Those coming on a little later, due to septicæmia, shock, auto-intoxication.

3. Those coming on still later, after weeks or months, due to asthenia from prolonged illness or lack of the internal ovarian secretion. All agree that a predisposition either hereditary or a disposition acquired is present in most of them, some asserting that no normal person ever becomes unbalanced as the result of an operation.

Some writers make no attempt to determine

[1] Read at the Meeting of the American Gynecological Society, April 22, 1909.

the kind of insanity following operation. Urbach (6) in the five cases he observed after 106 gall-bladder operations, classified them all as "acute hallucinatory confusional insanity" or as he terms it, the "collapse delirium." Rayneau (17) who has considered this aspect carefully, declares that the post-operative insanities conform to no one type. My own experience coincides with this, but I believe that the majority of the cases, however, do belong to the group of "acute hallucinatory confusional insanities."

As to the character of the operation, Selberg (14) notes that most of the reports in Germany relate to gynecological and ophthalmological cases and therefore regards these as the commonest causative factors. Picqué (8) strongly combats this view from a large experience, asserting that gynecological are by no means more likely than any other operations to cause mental post-operative aberrations. According to Picqué (8) an outbreak is commonest in children, in old people and in hysteropathics. My own experience is limited to adult women between the ages of seventeen and sixty-one years. Among them the period of greatest frequency is in the decennium between thirty-five and forty-five, when one-half of all the cases occurred. Judging by the literature, post-operative mental disturbance is as common in men as in women. Baldy (5) in eighteen institutions for the insane found that in fifteen cases ten were males.

My data are taken from my records in the gynecological department of the Johns Hopkins Hospital and from those of my private institution; the operations were abdominal and pelvic, most of them gynecological.

A word as to the character of the cases I have admitted to this group. All except prolonged, definite mental aberrations have been excluded; cases where delirium might be due to infection or intoxication have also been purposely left out. In none of the patients under consideration had there been a history of alcoholism or drug habit, so that delirium tremens and allied conditions are excluded. In a few of the cases there had been a mild infection, but the mental state has not seemed to bear any relation to the fever and intoxication. In many there was no infection, no suppression of urine, no drugs given after the operation, in other words I have limited myself to the pure psychoses due to shock, worry, or the effects of the anæsthesia. This is the group which Picqué (8) terms the true psychoses. While not including here the commoner milder mental disturbances, I cannot pass them without at least a brief reference. It is exceedingly common to note some change of humor after operation, and by close attention it is remarkable to note how many women manifest some well-defined change in disposition, irritability, depression, suspicion, etc., which vanishes in a day or two. In a consecutive series of 1,300 cases at my private hospital, there have been no less than fifty such cases, or one in every twenty-six. I have at present a woman under observation who is typical of this class. She is single, thirty-seven years old, a trained nurse, with good personal and family history; she is normally amiable and ladylike. For a long period she has had pelvic trouble, extreme pain, too abundant hæmorrhage at menstrual period, due to an adherent myomatous uterus. She had looked forward with anxiety to her operation and talked about it a great deal, and was in a highly wrought state of mental tension. I did an abdominal hysterectomy with the removal of both uterine tubes and ovaries. She had an infection in the fat in the incision which caused some rise of temperature, but noticeable above everything was her mental condition. She became irritable, bully-ragged her nurse, a warm personal friend, and insisted that she was going to die, that she was not being properly cared for, etc. This condition is passing away after a few days. Ordinarily this would simply be put down as peevishness and bad temper, but I feel sure that we have to deal with a definite psychosis, differing only in its severity from that which is on all sides recognized as insanity.

My sole reason for excluding this class of cases which is naturally associated with the others is that the limits of this paper do not allow their consideration. They represent the same changes in much milder and more transitory form, and I think would be of immense value to the trained psychiatrist in his study of the more severe forms. One can

trace, as it were, by gradual steps all the different degrees from the mildest case where the symptoms are just noticeable and pass away to that where there is raving mania which never passes off. The separation, therefore, which I have set up is an arbitrary one, the excuse for which is the limited time and the fact that it is the severer cases which give us concern and make the complication such a dreaded one.

Excluding this milder group, in about sixteen thousand operations there have been forty severe cases or one in each four hundred. Werth (1) in two hundred and thirty-eight laparotomies had six cases; Urbach (6) in one hundred and six gall-stone operations had five cases.

What has the character of the operation to do with the development of insanity after it? Is it the removal of the ovaries which brings this about? Is it the severity of the operation? Is it the duration of the anæsthesia? Take the forty cases of my series; they are:

Seven cases following repair of relaxed vaginal outlet.

Two cases following curettage of cancerous cervices.

One case following a cystoscopic examination.

Five cases following exploratory laparotomy with freeing of adhesions.

One case following dilatation of a urethral stricture.

Four cases following double salpingo-oophorectomy.

Four cases following hystero-myomectomy supravaginal with double salpingo-oophorectomy.

Four cases following radical operation for cancer of uterus.

One case following removal of gall-stone.

One case following removal of kidney.

One case following suspension of kidney.

One case following removal of left tube and ovary and appendix.

One case following removal of left tube and ovary and appendix and repair of relaxed vaginal outlet.

One case following removal of left tube and ovary.

One case following dilatation and curettage, suspension of uterus, and repair of relaxed vaginal outlet.

One case following suprapubic cystostomy for stone in the bladder.

One case following excision of rectum.

One case following excision of fibroma of bladder.

One case following exploratory laparotomy and suspension of kidney.

One case following removal of right tube and ovary and left tube.

One case following removal of left ovary and repair of relaxed vaginal outlet.

One is at once struck by the fact that psychoses seem as common after mild as severe operations. Note the number of cases (seven) after simple repair of the perineum, after curetting, etc. In none of these patients was there manifested either extreme physical exhaustion before, or hœmorrhage during, or shock after the operation. In one only a cystoscopic examination without anæsthesia was done. In the others ether, or gas and ether were employed. In the majority of our patients who take ether, immediately afterwards casts and albumin appear in the urine. It is possible that a similar toxic effect is produced in the brains of those patients who show trouble immediately after operation. In Germany, toxic effects of chloroform are much accused; from my experience ether may likewise be blamable. On the other hand cases occur after local anæsthesia, as in two out of the eight cases reported by Selberg (14). Grekow (18), in reporting one case in a woman thirty years old, attributes the condition to the fact that he used local anæsthesia. It would seem from all this that anæsthesia *per se* really has as little to do with producing the condition as the severity of the operation. Nor yet does the character of the operation seem important. Note that in only twelve out of the forty was double oophorectomy performed.

In a report of three cases, Olshausen (7) insists that supravaginal amputation of the uterus with accompanying removal of the ovaries is more likely to lead to mental disturbances than the complete removal of the uterus. My own experience would seem to show the reverse. Does not all this go to

prove that the kind of operation done is not a determining factor?

Although iodoform gauze drains were used in some of the larger operations, I do not feel that iodoform poisoning has an important bearing on this subject. Among the earlier authors this was much discussed and had both its defenders and its accusers.

Does heredity play an important part? The consensus is almost universal in this group of insanities as in all others, that mentally tainted, neurotic, alcoholic and luetic ancestry predisposes to insanity. Berkley (16) states that on an average 60 to 70 per cent of those in asylums show such an ancestry. My own case records would seem to argue the contrary, as in case after case it is noted that the family history is negative. I believe, however, that careful inquiry in a long series of cases would show the great importance of heredity. People, unless searchingly questioned, try to avoid all reference to insanity in the family history.

Of what importance is the personal history in determining psychoses after operation? There can be no question but that those who have previously been insane are likely to a recurrence after an operation. I have myself, however, operated on but a limited number of such cases and not one developed insanity as a result of the operation. My experience with alcoholics has likewise been small, and although these patients are well known to be most likely to develop insanity, I have had no post-operative ones. In ten out of the forty cases in the series there was a marked history of nervousness, hysteria, and neurasthenia for long periods before the operation. In some of the others there was a neurotic high-strung temperament. In recent years since my attention has been more directed to the matter, I have noted that these patients have, as a rule, a great horror and dread of the operation beforehand, that they have thought a great deal about it, many needing almost to be pushed into the operation.

Occasionally one notes a peculiar and unnatural exhilaration, so that the patient who has dreaded an operation at last comes to it in the gayest of humors, almost dancing into the anæsthesia room. Such a preoperative state calls for careful study as evidence of a decided want of mental balance.

While not denying that there may be some mental instability in most instances, I am convinced that a perfectly sound person may develop a post-operative psychosis.

My opinion is that the psychical shock of the operation as such leads in predisposed persons to post-operative psychoses of a severe and prolonged character. The operation in this way acts in a manner analogous to great fires, accidents, earthquakes and terror in producing insanity.

A much smaller proportion, it would seem, arise from infections and are like the febrile psychoses.

The opinion expressed by Rayneau (17) coincides with my experience, that post-operative insanity does not conform to any one type. The operation may bring to light a state to which the patient was predisposed, mania, melancholia, paranoia, dementia, acute hallucinatory confusional insanity, etc. I wish, however, to note that the "acute hallucinatory confusional insanity" is the commonest form, and indeed I believe where another predisposition is not present, that it is this form that is found. This fact was first noted by Urbach (6) who found it in all five of his cases after gall-stone operations. Out of the forty cases at my disposal, ten were acute maniacs, four were melancholics, fifteen were acute hallucinatory confusional insane, one was a paranoiac, one had a mild dementia, four were melancholic with periods of mania, and four cannot be classified. It is not worth while to discuss here the well known symptoms of mania which do not differ from those described in any text-book on psychiatry; suffice it to say that there is a wide variation in the degrees of the disturbance; practically all begin mildly, some remain in this state, but many go on to extreme grades. The maniac usually starts with insomnia and garrulousness, the memory seems even sharper than normal, although less under control, singing, cursing, tearing at bed clothes and the wildest movements follow. They usually know what is going on about them, know people and things. The melancholics with their peculiar delusions and hallucinations,

their apathies, failure to talk, etc., are also a clearly defined group; among these suicidal tendencies are common, two of my melancholics attempting this.

A word about the acute hallucinatory insanity, or as it is termed by Berkley (16) collapse delirium with motor excitement. There are marked delusions and hallucinations, but also a distinct confusion of the intellect, with great motor excitement at times. In the periods of depression these patients become oblivious to all surroundings, do not know their friends, may even cease consciously to take food and drink, yet they are maniacal, loud and noisy, but lack the flow of words and tremendous intellectual stimulation of the true maniac.

The majority begin showing symptoms between the second and tenth days; eight of my forty started almost immediately after operation; the longest period was one month. Contrary to Selberg (14), I find that the mental state has had very little to do with retarding the healing of the wound. Somatically with one or two exceptions all did well. As stated at the commencement of the paper there was, with a half dozen exceptions, no reason to attribute the psychoses to infections, as there were no fevers, the urine was normal, the bowels active, and so apparently auto-intoxication could be excluded.

The duration is variable, the shortest period among my patients was two weeks, advancing from this up to permanent insanities. I have always found my psychiatrical colleagues most cautious in giving any prognosis either as to the duration of the trouble or as to whether or not it is likely to be permanent. Unfortunately a number of the patients from the public wards at the Johns Hopkins were seen years ago, and although we have notes to show that the illnesses lasted for months, the patients have been lost sight of, and whether they remained permanently mad, I cannot say. Taking the fifteen cases from my private hospital records, where a better watch has been kept on their progress, I find that thirteen recovered and stayed well, one remained mildly demented, and one is persistently insane. From this group I am inclined to be hopeful in my prognosis of a post-operative insanity, but it is well always to be cautious in expressing an assurance that a given case will return to health, for the trouble may persist permanently, as in one of my earliest experiences in Kensington, Philadelphia. A poor girl with a large ovarian cyst was operated on successfully, as far as her physical condition was concerned, but had to be removed to the Norristown Asylum, where she died tubercular several years later. She had been greatly worried because her friends had accused her of being pregnant and said she came to me to have the pregnancy interrupted.

Let us see what the various writers say as to the prognosis:

MacPhail (19) estimates 60 per cent recoveries.

Werth (1) estimates 50 per cent recoveries.

Fillebrown (3), bad when anything but transitory.

Selberg (14) estimates 50 per cent recoveries.

Compared with these authors, my statistics are favorable as far as recoveries are concerned, but in spite of this the horror of the complication remains as one of the most trying and frightful experiences that can arise. The longer the trouble persists, the less are the chances of recovery. As a rule, and especially in confusional cases, the return to normal is gradual and extending over many days.

How can one avoid and how treat these complications? From what has been said about the causes, the family and the personal history must be carefully entered into. Insane relatives or alcoholic parents should put one on one's guard. Hysteria and neurasthenia in the patient must be considered. *Above everything else one should go into the circumstances of the trouble which bring the patients to you. Have they worried greatly?* Are they sure they are going to die? Do they dread the operation? Are they showing unusual nervous symptoms? Are they sleeping well? When these conditions are pronouncedly adverse and the operation is elective, i. e., not essential, put it off until things are more favorable. Before doing any operation, secure if possible the entire confidence of the patient, gradually bring them to look upon the operation as a small and normal thing. *Dis-*

abuse the mind of all gossip and false belief given by well-meaning but foolish acquaintances, especially the dread that the operation may change the psyche. If the family tend to excite the patient, exclude them from her room. Above all secure discreet, cheerful, congenial, and patient nurses.

The *reaction of patient to medicaments* should be known, iodoform should be sparingly used, the anæsthetic given in as small quantities as possible, and the operation done as quickly as possible. The *anæsthetist* must show tact and care in his management of the patient. All these things, while not so essential, should be thought of.

When the condition has once arisen in the mild and early stages, the patient must be kept in a quiet room, a nurse must be in constant attendance, lest the patient do herself some harm. She must be fed regularly but not forced. The bowels should be kept open, plenty of fluid given. All implements or ways in which patient can do herself injury must, so far as possible, be removed. Sedatives in the restless patients are sometimes necessary, but must be given with care; morphia, as a rule, contraindicated. When after a week or so the patient does not clear, it is my practice to put the treatment into the hands of a competent alienist. It is not infrequently necessary to transfer the persistent and violent patients to asylums.

Sometimes a patient who has long been suffering from an active delirium finally subsides into a condition of hallucination as to time and place and personnel which, as she slowly improves, becomes intermittent with lucid intervals.

In such a case I remember well a little artifice which greatly helped to hasten the restoration and to orient a patient. It is now about eighteen years since I was called to Cumberland, Md., to see a patient with a pelvis filled with inflammatory masses and what we then termed with more accuracy than elegance big pus tubes. She was very ill and the operation consisted in opening the abdomen, and thus guided by touch and sight opening and draining the abscesses *per vaginam*.

The long illness with the shock of the operation, limited though it was, proved too much for the psyche, and she lapsed into a typhoid delirium which lasted a number of days. Finally she began to notice her surroundings, but to her great distress, imagined she had been taken away from home and she plead constantly to be taken back again. After a few days when she seemed a bit more rational, I arranged a little dramatic scene, a ruse to bring her back. We arranged the big four poster bed in her mother's room for her and her old mother in the room, sitting where she had often seen her in the rocking chair by the window knitting. Then we picked her up out of her bed and carried her out of the room she was in through the next room across the hall, telling her all the while we were bringing her home. When she got to the door of the room she exclaimed, "Why there's Ma," and was very happy when we deposited her in her mother's bed. The hallucination was routed and she was completely restored by the ruse, and she never ceased wondering how it was we had brought her back again. So much affectionate anxiety had hovered over her sick bed as she seemed for days to lie between life and death, that the home coming of the psyche to its normal habitat lingers in my mind as a prettier and a more affecting little drama than any I have ever seen enacted.

One has to be careful in sending these patients to asylums, for as Selberg (14) rightly observes these post-operative delusional states may even acquire a forensic importance. Where the patient suffers from a delirium of persecution, she may carry over some of her bitterness and notions of wrong inflicted upon her into her saner condition, and she may even make her notions a matter of serious legal inquiry.

Under such circumstances it is important that the physician should at once be able to clear himself by having carefully kept notes as well as sufficient reliable testimony as to the patient's condition.

I have now a patient who refuses to settle his account because he imagines he was ill-treated, when, as a matter of fact, he came to me profoundly under the influence of drugs and soon became so maniacal that I had to send him to an asylum. But he, while recall-

ing nothing specific as to his own condition and conduct, remembers very well much that had to be done to restrain him, and keeps up a lively sense of resentment as though he had been subjected to unnecessary personal indignities.

Careful note taking, and good witnesses, and frankness with relatives will clear up misunderstandings of this sort if the case by chance comes to court.

CONCLUSIONS

1. Post-operative psychoses, seen often in childhood and the aged, occur also in women in the prime of life, most frequently between the ages of thirty-five and forty-five.

2. Anæsthesia, physical shock, the kind or severity of the operation are not effective causative agents.

3. Infection, auto-intoxication, drug intoxication are important factors, but there are many psychoses entirely independent of them.

4. Mild aberrations of a transitory nature are very common.

5. An unstable nervous system, and especially undue anxiety and worry about the operation and the trouble which leads to the operation are the most potent factors in bringing about profound nervous sequelæ.

6. Prognosis is favorable.

7. Prophylaxis consists in quieting and reassuring the patient. In this connection the nurse is most important.

8. Care should be taken to avoid any legal or forensic complications by frankly dealing with the family from the onset of the trouble.

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THE USES OF THE SENSES BY THE SURGEON

By WELLER VAN HOOK, M. D., CHICAGO, ILLINOIS

THE study of the uses of the senses by the surgeon has received far less attention than is the case with the medical man. The latter has had to depend so much upon hearing that he supplements the application of sight, which is the most comprehensive of the senses, with that of hearing in a manner the importance of which he has almost ceased to think of, so much is it a matter of everyday routine and necessity to him.

Vision is the master sense. No one will deny that,— for with its aid one may make good in many ways the loss of one of the others. For the medical man hearing is probably of next importance.

For the surgeon this is certainly not the case, for touch occupies that place. Sight, up to this time, has been given overwhelming influence in surgical work as the result of the enormous impetus given to morbid anatomy in the last century. During the period before the introduction of anæsthetics extreme swiftness of execution was a necessity of our art. And this haste was the less deprecated because the knowledge of morbid anatomy was but slight and the hasty removal of a diseased part was all that was expected.

The introduction of the careful autopsical method of studying morbid anatomy, especially with the aid of exact inspection, led

to the adoption of careful dissection under anæsthesia.

We do not hesitate to make the charge that this method was carried too far. The interest of the patient is always personal, not impersonal; always particular, not general. He has no wish to be the victim of the notorious *autopsia in vivo*. He may be desirous that all hidden processes be revealed and studied in so far as this is done in the interest of the recovery of his own body's integrity and usefulness. But he is not willing that his body shall be used for the prosecution of such studies as have their origin in the surgeon's curiosity about morbid processes in general, whether this inquiry is prompted by an unselfish desire to benefit science or whether he merely seeks to enlarge the limits of his own personal experience.

The European surgeons of the early antiseptic days were impressed with the feeling that the morbid anatomical world was theirs. They made enormous incisions, used instruments of cyclopean proportions, multiplied assistants, stalked about in rubber fishing boots, flushed cavities with tubfuls of antiseptic water, drained with huge pipes of glass and rubber, packed with vast masses of gauze, and covered their wounds with enormous volumes of ingeniously piled-up dressings.

Practical American surgeons have done much to improve these conditions and especially to insist that the interest of the patient upon the table is paramount, that he should be treated as the surgeon would treat his own son, at every step.

Now these remarks have their just bearing upon the use of the senses by the surgeon. For we wish to insist that even to this day the tradition that all that is diseased must be exposed to the surgeon's eye, holds the profession in a kind of terror. This attitude of our fellows is due to the notion that no distinction ought to be made between that which is required of the experienced surgeon and that which we expect of the tyro. The distinction ought, however, to be recognized. The man who has done much surgical work should use methods differing in certain ways from those which are followed by the beginner. The neophyte should be content to make use of longer incisions than the older man needs to employ. He should insist upon seeing more of what lies before him than does the man who through a small opening can recognize the normal anatomy of the part and deal with observed variations from it.

The older man can do his work in a superior way, not only because he has greater manual facility but because his familiarity with the normal and morbid anatomy of the body is great and he recognizes common conditions almost "intuitively." The younger man must first of all familiarize himself with the anatomy of the body and variations from its form in every way possible. No legitimate opportunity may be neglected by him to acquire this knowledge. But it is not only an acquaintance with the facts of normal and morbid anatomy that gives supremacy, it is also the education of the senses that aids in reaching high operative skill.

The operator should endeavor to gain a notion of the normal anatomy of the different parts of the body which is three dimensional. Compelled by the limitations of pictorial art to represent anatomical facts by means of drawings or photographs upon plane or two dimensional surfaces, the teacher who has not fresh material at hand must make use of sections of the body, relying upon the constructive imagination of the student to gain the stereoscopic or three dimensional effect; he must use models or he must use the pictorial devices of the draftsman to suggest, by shading, thickness of line, sharpness or dimness of outline or variation in the size of the figures, their relative magnitude, texture, and position. The difficulties in the way of imparting a just idea of the stereoscopic relations of anatomical parts by drawings are absolutely insuperable. This has long been recognized and the attempt was abandoned centuries ago when the rational study of anatomy was begun upon the bodies of dogs and cadavers.

To-day these ideas are acquired by the actual dissection of the cadaver, by the study of models and by the intellectual or mental reconstruction of sections of the body into their conceptual wholes.

Topographical anatomy is anatomy studied

according to places or regions. The surgeon must study his anatomy from the stereoscopic point of view. Let him, in every case before which he stands, ask himself if he can construct in his own mind a model of what is beneath the skin of his patient's body. Can he accurately picture the structures of the region involved? If he cannot do this he is not properly familiar with the normal anatomy of the part or he is not able to make such an exact diagnosis of conditions as is necessary, and his operation must be considered tentative, experimental, or exploratory.

Having gained a fixed or tentative conceptual model of the structures before him, the surgeon must continue his study by the use of season based on the observations made with the aid of the senses. The senses of hearing and olfaction are of less use than the sense of vision. But it is our present intention to lay stress upon the use of the sense of touch, in which we will include the sense of muscle resistance.

The sense of touch may be cultivated to a point of great refinement in persons who have such natural endowments as entitle them to begin the practice of surgery. We must distinguish between those elements of sense-perception which pertain first to the external or mechanical part of the act and those which in the second place have a bearing upon the reception of the impression and the intellectual uses to be made of the registered impression.

In the first place Hall states the common opinion of physiologists that individuals vary in their acuteness of tactual sensation. But he also says, "The tactile sense is best developed in persons whose senses in general are well-developed, for example, a laboring man was compared with a young woman in twelve points of observation, and she uniformly excelled him. But not in tactile sense alone did Miss X excel Mr. Z. Her sense-perceptions in general were more acute."

One who advocates more extended reliance upon the tactile sense meets with the objection that many surgeons have a poor sense of touch. To this we must reply that the acuteness of sense-perceptions can be heightened to a remarkable degree by training and education. Every advantage must be given the sense-organs themselves. The epidermis of the fingers must not be thickened by hard usage, but every effort must be made to keep the hands soft, clean, and free from cuts and abrasions. Gloves should not be worn at operations unless required by the exigencies of asepsis. They diminish the tactile sensibility in a marked degree as any one may learn by simple experience. Where gross work is to be done the difference is not so noteworthy as is the case where delicacy of touch is vital to success.

MALIGNANT LEIOMYOMA OF THE UTERUS

By MAX W. MYER, M. D., St. Louis, Missouri

FEW tumors which fulfill all the clinical and pathological requirements of a malignant leiomyoma have been reported. Most of them lack in at least some of the essentials, while others, which have been described as belonging to this class of tumor, are very doubtful.

The writer desires to record a case which seems to fulfill all essential requirements from both the clinical and pathological standpoint and to represent a rare and unusual type of tumor.

Patient, a colored woman, age 42 years, was admitted to the Parker Memorial Hospital at Columbia, Mo., on November 10, 1902, on account of an abdominal tumor.

The family history was negative.

Patient had always been healthy until the present trouble developed. She began to menstruate at the age of fourteen. Nineteen years ago, she had a normal partus. The child died of tuberculosis at the age of seventeen months.

About five years ago the patient had severe pain, headache, and nausea during her menstrual period. After this time she was treated by a physician, but a diagnosis of tumor was not made. Shortly after she discontinued treatment a mass was noted in the abdomen. This did not cause any symptoms except at the menstrual period, when it seemed to increase in size and cause pressure symptoms. Last March a severe hæmorrhage developed which lasted for five weeks without intermission. Since this time there has been a metrorrhagia. About five weeks before admission to the hospital a severe hæmorrhage accompanied by pain in the abdomen, distention, nausea, and vomiting occurred. After this time the pain was more or less constant, but especially severe at stool. No difficulty voiding urine.

Thorax. Lungs normal. Heart showed a roughened first sound at the apex, otherwise no recognizable change.

Abdomen. In the lower abdomen was a tumor, situated directly in the median line and extending from the true pelvis to two fingers' breadth above the umbilicus. The mass was of a hard, elastic consistency, firmly fixed, and very sensitive to pressure. Two bands corresponding in position to the round ligaments could be palpated. Placed in front of the large tumor mass was a small one, the size of a small fist and of the same consistency as the parent growth. No free fluid in the abdomen.

Vaginal examination revealed a tumor firmly fixed in the pelvis. Cervix was almost completely effaced and passed directly into the tumor mass.

External os admitted one finger. Tubes and ovaries could not be palpated.

Urine negative.

Hæmaglobin 30 per cent.

Diagnosis. Multilocular fibroid of the uterus.

Operation. On November 12th an abdominal panhysterectomy was done. The small tumor was found to grow from the omentum. No relation between this and the tumor of the uterus. The entire omentum was studded with small hard bodies, varying from the size of a pea to a hazel nut. Stomach and liver were free from any metastases, as were also the visceral and parietal peritoneum. No free fluid in the abdomen.

Post-operative history. The patient made very satisfactory progress for five days. Her pulse was, however, somewhat rapid throughout, varying from 100 to 114. At 9:30 on the morning of the 17th without any premonitory symptoms, a cerebral embolus developed. She immediately developed a right-sided paralysis, both motor and sensory, with aphasia. Eyes were deflected to the left. Patient was unconscious for some time after the attack. Reflexes at first increased, afterward normal. Examination a few moments after the attack showed a probable acute

Fig. 1. Section through tumor.

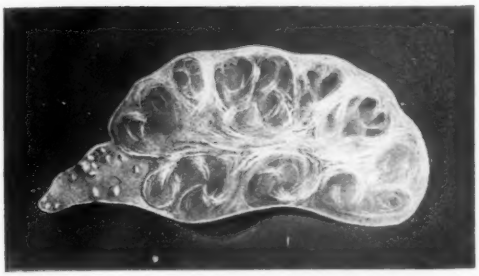

Fig. 2. Section through metastatic tumor.

insufficiency of the heart. Incontinence of urine developed the following day. The pulse within twelve hours after the attack was between 50 and 60, and remained so until about twenty-four hours before her death, when it again became very rapid. Temperature was normal to within twenty-four hours of her death, which occurred at noon on November 21st, nine days after operation. Autopsy was not permitted.

Description of tumors. The tumor mass has developed entirely from the uterus. Its size is about that of a six months' pregnant uterus. The contour of the tumor is on the whole regular. At several points only, small nodules can be seen.

The adnexa are normal. Upon median section (Fig. 1) we have a diffuse growth giving the following measurements: length 18 cm., width 15 cm. At the fundus of the uterus the wall is 2 cm. thick, while at the middle of the tumor it measures 7 cm. The uterine cavity is completely filled by a blood clot. Macroscopically the tumor resembles a simple fibroid. At two points small encapsulated fibroids are seen. One small area shows hæmorrhagic degeneration. The cervix is completely effaced and passes directly into the tumor mass.

The metastatic tumor (Fig. 2) from the omentum is about the size of a child's fist. On section it shows the same general structure as the uterine tumor.

Microscopic examination. The tissue was originally hardened in formalin. Pieces were taken from different areas of the tumors and stained with hæmatoxylin-eosin, Heidenhain's iron-hæmatoxylin and Van Giessen-Ernst. Other pieces were transferred into bichromate and afterwards stained with Mallory's aniline blue connective tissue stain. The majority of the sections show the typical picture of a fibroid. The cells are of a spindle shape, with rod shaped nuclei and the usual overlapping of cells. (Fig. 3.) In many sections, however, cells of a large oval shape with multiple nuclei and with mitotic figures are seen. (Fig. 4.) Other cells of a rather transitional type from the spindle to the large oval are present. (Fig. 4.) One section taken from the area where macroscopic degeneration could be recognized, was particularly rich in the large oval cells, and a slight degeneration of muscle cells was also noted. The elongated cells are of two types. The first are muscle cells with distinct myofibrillæ. (Fig. 5.) These cells were in all stages of development from the simple elongation of the branched connective tissue cells to typical adult smooth muscle cells. The developing cells show all stages in the development of the myofibrillæ. Younger cells had few fibrillæ and much granular protoplasm. In the older cells fibrillæ filled almost the entire structure and very little granular protoplasm could be demonstrated. Myofibrillæ showed as either coarse or fine fibrillæ (Fig. 6), rather uniform in caliber, and usually running continuously through the entire length of the cell. In many of the muscle cells containing fibrillæ, mitotic figures were seen, showing that there was actual division of muscle cells. (Fig. 7.) The second type of spindle cell was merely an elongated connective tissue cell, which never reached the length of an adult muscle cell and showed no myofibrillæ. In most sections the muscle cells predominated, but

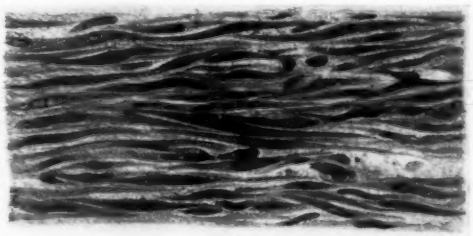

Fig. 3. Metastatic tumor, showing typical unstriated muscle cells. Hæmatoxylin-eosin. x 300.

here and there connective tissue cells were abundant. Everywhere among muscle cells, connective tissue cells were found in greater or less number. The

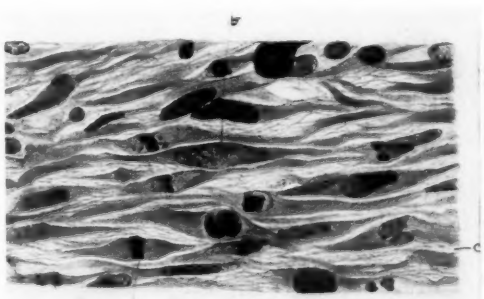

Fig. 4. Metastatic tumor, showing transition from the spindle shaped muscle cell to the large oval cell. *a*, mitotic figure in a transforming muscle cell; *b*, large spindle shaped cell; *c*, interstitial connective tissue fibres. Hæmatoxylin-eosin. x 500.

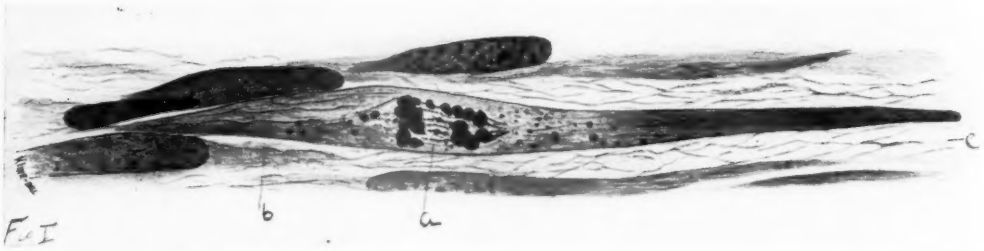

Fig. 5. Metastatic tumor. Smooth muscle cells undergoing mitosis. *a*, mitotic figure at anophase; *b*, myofibrillæ; *c*, interstitial connective tissue. Iron-hæmatoxylin. x 700.

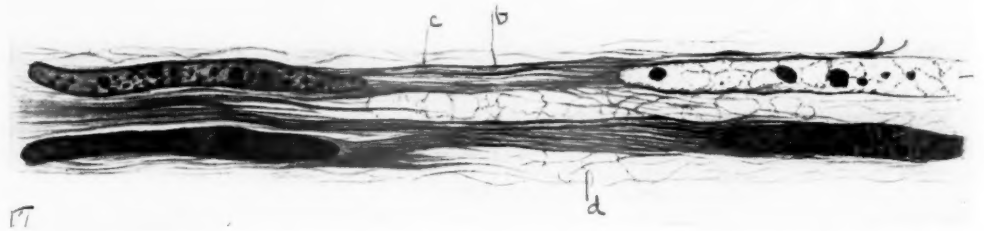

Fig. 6. Metastatic tumor. Section of typical smooth muscle showing the myofibrillæ and syncytial structure. *a*, muscle nucleus; *b*, protoplasmic anastomosis; *c*, myofibrillæ; *d*, interstitial connective tissue. Iron-hæmatoxylin. x 700.

connective tissue cells were in all stages from ordinary small branching cells to the large spindle shaped cells. These cells also showed mitotic figures and in places indication of degeneration, such as pycnosis.

The tissue stained with Mallory gave a distinct differential stain. The myofibrillæ were stained red and the fibrillæ of connective tissue cells blue. The microscopic examination of the metastatic tumor showed precisely the same pictures as that of the uterine tumor. In fact, all the drawings were made from the metastatic tumor, in that we regarded this as more conclusive than if taken from the primary growth.

We have in the case just described both from the clinical and histological pictures, findings which justify the diagnosis of a malignant tumor. Just this type of tumor is rare

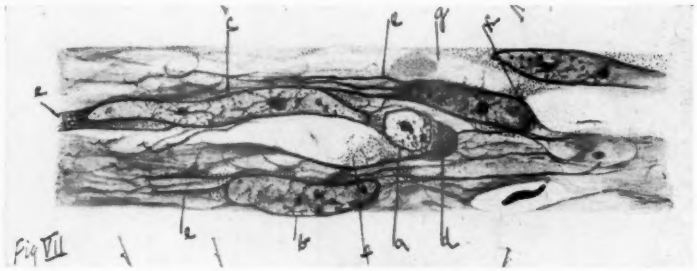

Fig. 7. Metastatic tumor, showing growth of tumor by new formation of muscle tissue. All stages of transition from ordinary branched connective tissue cells to smooth muscle cells. Distinct protoplasmic anastomosis between developing cells. *a*, branched mesenchymal cell; *b*, slightly elongated cell still showing protoplasmic branches; *c*, nucleus of much elongated cells showing distinct muscle structure; *d*, myofibrillæ forming in a branched cell; *e*, myofibrillæ in the elongating cells; *f*, syncytium of granular protoplasm; *g*, interstitial connective tissue. Iron-hæmatoxylin. x 700.

and is of interest for its unusual growth of smooth muscle cells and metastases.

The nomenclature of these tumors still furnishes much discussion, some regarding them as typical sarcoma, while others would class them as malignant leiomyoma. Mallory would call all tumors leiomyoma, which arise from smooth muscle cells, whether their growth is slow or rapid. He regards it difficult to determine just what should constitute malignancy in these tumors, since even the rapid growing tumors at the time of their removal do not invade the contiguous tissue or produce metastases; while several cases of dense leiomyoma, showing slow growth, have produced metastases. Mallory is inclined to think that many leiomyoma would show signs of malignancy but for their early removal.

Robert Meyer, in the study of the histogenesis of muscle cell sarcoma, discusses this type of growth under the names, sarcoma myomatoides (Borst), and leiomyoma malignum uteri (Mallory). Under these divisions he includes that group of tumors which take their origin from the smooth muscle cells, in contradistinction to the myosarcoma or mixed tumors. Meyer regards many of the so-called malignant leiomyoma as not belonging to that class, in that the muscle cells have changed into spindle cells and all possible cell forms and are not pure leiomyoma. He would limit the term leiomyoma to the tumors of pure muscle cells which produce metastases, although here, too, he admits the presence of certain transitional spindle cells.

The literature has few cases which can be classed under the group of malignant leiomyoma. Krische reported in 1889, a case which has been generally accepted as the first fibroid of the uterus with multiple metastases. A small encapsulated fibroid the size of an apple was found on the posterior wall of the uterus. No tendency to infiltration of the contiguous tissue was noted. A number of tumors of similar structure and some larger than the uterine tumor were found in the abdominal and thoracic viscera, as well as the skin, dura, and skull. Krische admits the difficulty of recognizing the primary tumor, but is inclined to regard the uterine as such, since this is the most common source of development of the fibromyoma. There seems some doubt with the present requirement for the classification of malignant leiomyoma, as to the undisputed acceptance of this case.

The primary growth of the uterus in the writer's case is entirely of the diffuse type. Several small encapsulated fibroids are present, but these do not seem to take any part in the active growth. At no point do they seem to invade the contiguous tissue. The growth has developed directly from the uterine muscle cells. This seems to be the first diffuse tumor of this type reported. Ulesko Stroganowa refers to the possibility of such a growth. The cases reported by Van Beesten, Klebs, Minkowski, Langerhans, Krische, Mallory, Schlagenhaufer, and Ulesko Stroganowa have all developed from encapsulated fibromyoma.

Few, if any, of the other cases have fulfilled both of the requirements of Meyer for a malignant leiomyoma, namely: invasion of the contiguous uterine tissue by the primary tumor and the development of metastases. Cases reported by Mallory and Meyer have invaded the contiguous tissue, but have not produced metastatic tumors; while the cases of Krische, Langerhans, Minkowski, Schlagenhaufer, and Ulesko Stroganowa have produced metastases but have not shown an invasion of the tissue. The tumor described in this paper seems to fulfill all the essential requirements for such a classification.

Thompson gives a pathological report of a retroperitoneal tumor reported by Dorsett, in which his microscopic findings correspond in almost every detail to the writer's case. This tumor has been accepted by Mallory as a malignant leiomyoma.

There can be no question from the microscopic findings in this case but that the tumor mass is made up primarily of smooth muscle cells. That this is not a simple sarcoma due to a process of degeneration of muscle cells into sarcoma as described by Meyer is self-evident. Meyer claims that the malignant leiomyoma exists only when we let drop the sharp boundary between myoma and sarcoma cells, and this is probably true. It is not unusual to see both smooth muscle cells and connective tissue cells developing from the same syncytium, as has been clearly demon-

strated by Caroline McGill. Hence a differentiation in the pathological state must of necessity be difficult. We have in this process embryological rather than adult cells, as is shown by the microscopic findings. Adult muscle cells rarely show a karyokinesis and the presence of the fine fibrils is typical of the young cell.

If any doubt should exist as to the tumor being essentially formed of smooth muscle cells, an examination of the metastatic tumor of the omentum should be convincing. The same microscopic picture exists as in the uterine tumor, namely, smooth muscle cells, some connective tissue cells, and the large oval cells with multiple nuclei. Active mitosis is also present in these cells. Such a picture could not exist in the metastases of a pure sarcoma.

We have in this case a metastasis of smooth muscle cells, or what seems more rational, a metastasis of embryological cells, which have, after being transported to the omentum, developed on the one hand smooth muscle cells and on the other connective tissue cells. Borrman, in the report of a case of angioma, which had produced metastases, refers to the possibility of the transplantation of embryological cells, before differentiation has taken place.

In accepting the term malignant leiomyoma it is wrong to regard it as a simple histologically benign fibroid, which by some unknown and not feasible process has developed metastases. It is much more rational to regard the tumor as developing from active muscle cells, as shown by the mitosis, or better still from embryological cells, cells, which according to Meyer may be histologically benign, but are biologically malignant.

The final summary becomes more or less a matter of nomenclature. Undoubtedly the tumors are closely related to sarcoma. It is more a question of what constitutes malignancy in the cell itself and this unfortunately cannot be answered. If, however, we accept the growth as a fibroid composed of cells, which even though they retain their distinct muscle type, are malignant, and not as a benign fibroid with accidental metastases, the term leiomyoma is certainly applicable.[1]

For much valuable assistance in the cytology, I am indebted to Miss Caroline McGill of the University of Missouri, at Columbia, where this paper was in great part prepared.

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[1] Since writing this paper there has appeared, in the Journal of Experimental Medicine for September, an admirable article by Mallory on the Results of the Application of Special Histological Methods to the Study of Tumors. He reports three cases of malignant leiomyoma of the uterus. These are all concentric fibroids invading the contiguous tissue. No metastases. The microscopic findings of the second case correspond in every essential detail with the case reported. The plates show very similar pictures.

TUBERCULOUS INFECTIONS OF THE PERITONEUM[1]

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THE eight cases upon the consideration of which this paper is founded, furnished to the writer a series of data and problems whose many-sided interest it would be hard to overestimate.

Uncertainty is the characteristic element in the preliminary diagnosis of all tuberculous infections of the peritoneum; surprise inevitably awaits the surgeon as he opens the abdomen; and the unexpected sits even at the elbow of the pathologist as he examines the specimen in the laboratory. More than this — mystery veils every step in the after progess of these cases, even when they make their exitus into the crowd, grateful to the surgeon for the cure which he often cannot understand.

Syphilis — that great clown of the pathological world — plays few tricks on the stage spread within the peritoneal cavity; but tuberculosis — his tragic sister — lurks to trap the unsuspecting in every fold of mesentery and omentum.

From that Christmas eve in 1862 when Sir Spencer Wells operated on the case which presently became the first recorded operative cure of tuberculous peritonitis, to our own post-Listerian era when König still calls for a reason for his own cures, the Sphinx of medicine has sought vainly for an Oedipus to solve her most fascinating therapeutic riddle. It will not be altogether unprofitable if we gather together again from various sources, the many separated threads of the story of this first case. Wells himself never completed the history; and it was left to a German investigator, with all the Teutonic passion for verifying data, to look up the patient, after twenty-five years, and prove her still alive and still cured (Kümmel, 1887; König, 1889).

In 1862 Mr. F. Seymour Haden was well known in London as a surgeon. He became later, still better known throughout two worlds as the greatest etcher since Rembrandt;— still more, he was the brother-in-law of James McNeil Whistler, and one of the teachers of our own Joseph Pennell. Whether Haden etched or practiced surgery as his principal *forte* he has never publicly indicated. That he was a master etcher the artistic public the world over will bear witness, but, to those who are not familiar with the following narrative, it may come as a surprise that he was also a master of the art of surgical diagnosis. In August of 1862 Mr. Haden was called to attend a young woman, aged 22, suffering from abdominal dropsy. Although she was of reasonably healthy appearance Haden thought her trouble turberculous and tapped her twice, removing the last time about 18 pints of amber fluid. The fluid presently returning, Spencer Wells was called in, and — tuberculous ascites not being his specialty — identified an ovarian tumor. Whether the ordinary rule that "the wish is father to the thought" operates even in the minds of great men is not clear in this instance, but it is a matter of history that Wells cut for ovarian tumor (Dec. 24, 1862), and found what the painter-etcher prophesied — the ascitic form of tuberculous peritonitis.[2] It is of passing interest that the anæsthetic in this case was given by Clover, and that Savage was second assistant. After pumping out the abdomen with a Davidson syringe and closing it in the manner customary in those days — which meant a ventral hernia— another surprise awaited the surgeons and the patient — she got well. Haden writes in 1864 that he met her, quite casually, on the street and noted, to his astonishment, that she was apparently in robust health and of no unusual girth except for the bandage which she wore to retain her hernia. We may thank Haden more than commonly for thus sparing even a moment to record this extraordinary surgical observation, for was he not at that time in the midst of his great series of Thames etchings?[3] Once

[2] There were "myriads of tubercles," and multiple adhesions.

[3] Haden etched 33 plates in 1864, 11 in 1863, 22 in 1865 — principally the Thames series and those from Ireland. In 1870 he etched the "Agamemnon," which sold for £2,500 in its first state, and in 1874, the great copy of Turner's "Calais Pier."

[1] Read before the Chicago Surgical Society, June, 1909. See Transactions of Societies for discussion.

more, in 1872, Haden lowers the curtain to tell us that the woman is happily married, but without children — remember those adhesions! Again in 1882, Wells, in his second book — nearly a verbatim copy of his first, — spreads the types apart enough to slip in the announcement that the case is yet above ground. Finally in 1887 and 1889 Kümmel and König reported from Germany that the lady was still evading the button molder's ladle. Surely Sir Spencer, without dwelling uncomfortably upon the mystery surrounding the recovery of his patient, could justly say: "This case might well serve as a striking appendix to that unusual collection cited by Martin in his curious paper on 'The Operative Treatment of Peritonitis.'"[1]

Whilst Wells, with the Englishman's fondness for chronicling his own doings, has thus put himself on record with the first case of tuberculous peritonitis cured by incision, it does not appear that he ever understood himself to have stumbled on a great therapeutic discovery, for the case remained unique (with the exception of one reported in 1874 by Petri), until König in 1884 reported three cases, and seriously proposed coeliotomy as a curative measure.

So stimulating was König's suggestion that in 1890 he was able to collect a series of 131 cases from German operators, 107 of which were improved or well after two years; every one of the various forms of tuberculous infection was represented among the cures.[2]

It is interesting to note the inductive reasoning by which König reached the conclusion that these forms of peritonitis might yield to free incision, with or without drainage. Bearing in mind the development of the peritoneal sac, and its apparent structural resemblance to the large joints, he argued[3] by analogy — although the analogy included no explanation — that the same treatment might be applied to the peritoneum, which had proved so successful in the cure of tuberculous hydrops of the knee and other joints. We will endeavor to show, later on, that it is unsafe to base too many important details of treatment on any study of the resemblance between the peritoneum and the large joints.

That König was fully alive to the view advanced in 1900 and 1901 by Borchgravinck and Christian Fenger, that the *vis natural medicatrix*, unassisted, might not only bring about many spontaneous cures, but might also have a hand in certain of these operative cures, is shown clearly in his observation[4] that "on account of the many healed scars of intestinal and peritoneal tuberculosis we must separate ourselves definitely from the old notion that these forms of tuberculosis cannot tend to spontaneous recovery." This does not alter the sound statistical basis of König's general contention that incision cures a larger percentage of cases than those treated by *laisser faire* methods. Thus Fenger himself states[5] that something over 35 per cent of that class of cases which were formerly fatal, recover after operation, and several series of statistics by reliable authorities show the cures through surgical measures to range upwards from 60 per cent (Moynihan Surg. Opr., 1905, p. 89) for all cases.

SEX INCIDENCE

Not the least striking among the paradoxes of this disease is the curious apparent difference in its incidence among men and women, when we compare statistics gathered from the operating table with those taken from the dead-house. König[6] reports that of 131 patients operated, only 11 were men;[7] but of 107 cases examined post-mortem only 18 were women. This observation is confirmed by Rolleston[8] and probably has a sound foundation in fact,[9] but the reason usually offered for the variant incidence in the sexes — namely, that women come more frequently to the operating table, and men to the post-mortem table — is hardly either sufficient or obvious. It may be conceded that tubal infection furnishes a more fulminant line of attack in women than any of the ordinary methods of invasion occurring in men, in whom the ascitic and appendicular

[1] Sir S. Wells: Ovarian and Uterine Tumors: 1873 and 1882.

[2] Czerny reports 50 to 60 per cent cured: Rorsch reports 275 out of 358 cured; Wunderlich, 81 died after operation; 80 alive after two years; about 40 per cent unaccounted for.

[3] Spec. Chir., II, 156, 1889.

[4] Centralblatt fur Chirurgie, 1890.

[5] A. of S.. Dec., 1901, vol. 34.

[6] C. f. Ch., 1890, p. 657.

[7] Nothnagal: 90 per cent were women. All of the cases of tuberculous peritonitis cited by Murphy were women. A. J. of O., 1903-4.

[8] Osler, vol 5, p. 567.

[9] Of my own eight cases, 5 were adult females, and 3 male children.

forms of tuberculous peritonitis are about the only forms coming to the operating table. But it is probable that whilst men escape abdominal operations more frequently than women, and that their intra-abdominal lesions are more apt to be first recognized in the dead-house, the percentage of sex incidence would be quite equalized, were we to add to the percentage of male operated patients those who suffer from tuberculosis of organs whose female homologues are intra-abdominal; or were we to deduct from the percentage of laparotomized women, those who suffer from secondary, or ascending tuberculosis of the intra-abdominal genitals, and tuberculous peritonitis incidental thereto.

METHOD OF INVASION

This disease reaches the peritoneum by three great channels: (1) *hæmic* — through the blood current, as in the acute miliary form found in generalized tuberculosis; (2) by *conliguity* — as in the form secondary to tuberculosis of the lymphatics or to unperforated ulcers of the bowel; (3) by *continuity* of tissue or surface — as in the form secondary to ulcerated and open tubes or bowels, or in those forms due to the spread of the germ by lymph currents or gravity along the already infected serous surface.

By far the greater percentage of infections are secondary to deposits lying either contiguous or in direct continuity. König reports only 12 out of 107 cases as hæmatogenous — from acute miliary tuberculosis located at a point remote enough to be reached only by the blood current; to this form may belongs a case observed by the writer in which the original invasion was pulmonary, although it is not impossible that the peritomal infiction was due to direct spread from the ulcerated bowel.

CASE 1. Pulmonary tuberculosis: ulcerative tuberculous peritonitis; multiple abscesses; obstruction; drainage; fæcal fistulæ; death.

E. W., single woman, aged 27: ill six months; hectic fever —— T. 98–103; expectorates profusely, swallows expectoration; small cavity in left lung; abdominal pain; diarrhœa alternating with constipation; lately constipation has increased until at present there is almost total obstruction. Abdomen rigid, distended and tender, giving an indistinctly boggy feeling suggestive of deep fluid under a thickened mass. Operation requested on account of obstruction.

Operation. Incision above navel showed thickened mass to be hardened omentum. Abdomen contained little fluid, but adhesions were very dense, and when separated disclosed numerous small abscesses communicating with the bowel. After sponging fluid and pus from all accessible pockets, gauze drainage was introduced through a counter opening, and the principal incision was closed. Obstruction was relieved, but at expense of a fæcal fistula at every point where drainage was introduced. Patient died of exhaustion in four weeks.

As to the existence of tuberculosis which is actually primary in the peritoneum, we must strongly question the possibility of such invasion. Whilst there can be no doubt that any primary tuberculous ulceration of the bowel — no matter how insignificant in point of size — due to ingested sputum, milk, meat, etc., may serve to carry the infection still deeper, either to the mesenteric lymph-nodes, or directly through the lymph spaces to the contiguous peritoneum, the notion of invasion through and across unbroken membranes is without parallel, and would appear to be an unnecessary tax on our credulity. Even those writers who cite such cases among their statistics give them a very low percentage — 1 per cent or less, and it is not difficult to believe that even in these cases there was a bowel lesion, but so small as to be overlooked (Munro and Rolleston hold this view).

We may admit that Rokitansky, writing in 1845[1] said: "Peritoneal tuberculosis appears occasionally as a primary infection, the peritoneum being the first tissue attacked, although it occurs with far greater frequency secondary to tuberculosis of some other organ." But it is quite unlikely that, had Rokitansky had the advantages accruing to more modern pathologists in starting where his own studies left off, he would ever have permitted himself to have made so general a statement. In their agency as primary atria of infection, the ovary and the peritoneum would appear to hold the same relative status, and Rokitansky himself not only denies[2] *primary* ovarian tuberculosis, but says: "The occurrence of tuberculosis in the ovaries is at least doubtful; so far as our experience and observation go, we must deny it altogether." Rokitansky had an experience extending over the examination of some 30,000

[1] Hdbk. of Path. Anat. Sydenham Soc., trans., 1855, II, p. 29.
[2] Loc. cit., ii, 252.

bodies, but he was certainly wrong in this latter contention, unless he wished to allow the reader to infer that he referred only to tuberculosis occurring in the interior of the ovary without surface infection. And yet even in this contention, Rokitansky was probably wrong, for several recent cases are on record where the interior of the ovary contained the only *genital* focus. Finally Murphy quotes Schottlander's 157 cases of ovarian tuberculosis in which none were primary in the ovary.[1] We may repeat, then, that in immunity from infection the peritoneal and ovarian structures would appear to hold the same position, and because of their protected location, are never the seat of primary tuberculosis.

Although peritoneal infection through contiguous tuberculosis of the spleen, kidney and male genitals occasionally occurs, by far the larger percentage of invasion take place through contiguity to, or continuity with, ulcerations of the bowel, lymph glands, and female genitals, with a relative frequency index for the respective structures of about 4, 2, and 1. König calls attention to the striking similarity existing between the spread of tuberculous ulceration from the epiphysis into the joint, and the secondary invasion of the peritoneum from adjacent structures. Such invasion may occur either through the rupture of tube, appendix, gland, or bowel directly into the peritoneal sac, or through the spread of the bacteria across a bridge of diseased but unbroken tissue.[2]

CASE 2. Tuberculous ulcer of ascending colon: local tuberculous peritonitis without perforation; adhesions; abscess; open treatment; recovery.

Patient healthy looking, but rather spare boy, aged 13, without tuberculous history, entered hospital for operation for appendicitis. Tumor well defined, sausage shaped, and well walled off.

Operation. Abdomen contained a little clear fluid; no tuberculous deposits; appendix was free and normal; the freely movable tumor was a wad of omentum plastered over the ventral aspect of the colon. Separation of the omentum disclosed a hard area surrounding a cup-shaped excavation on the surface of the colon large enough to hold a lima bean, filled with cheesy pus, and lined with ragged bluish tuberculous granulations. The cavity did not communicate with the bowel. Mesenteric glands moderately enlarged, but were not removed. Diseased omentum amputated; bowel stitched into the wound and cup-shaped cavity packed with iodoform gauze. No fæcal fistula developed; at the end of five weeks the wound had healed and the patient left the hospital apparently well. After eighteen months patient was still in good health.

The germ once having gained access to the peritoneum, continuity of tissue and gravity play the most important roles. The tuberculous tube, appendix, or intestinal ulcer is surrounded by a localized but widening zone of secondary deposits; unless the adhesions move faster than the disease, and delimit it by exclusion from the general cavity. This border warfare between lesion and adhesion is well illustrated in nearly every case of tubal tuberculosis, where partial or complete walling off of the diseased area and cicatrization of individual lesions is a common observation. As to the important role played by gravity in determining the location of the greater number of secondary deposits, Murphy's classical and conclusive experiments upon monkeys[3] have shown that secondary peritoneal tuberculosis occurs most commonly where gravity most frequently carries the germ. McCallum may be correct in his unlikely contention that the major peritoneal lymph currents travel against gravity toward the diaphragm, yet there can be no doubt but that peritoneal tuberculosis finds its readiest florescence in the most dependent parts of the abdomen and below the line of the navel. Not only is this true, but Murphy has also demonstrated that the pelvic, rather than the subdiaphragmatic lymph nodes, suffer most extensively from involvement secondary to that of the peritoneum.

CLASSIFICATIONS OF THE LESIONS; SECONDARY RESULTS; METHODS OF HEALING

Although there seem to exist as many classications of the forms of tuberculous peritonitis as there are writers on the subject, *there is but one lesion*, and the basic form which it takes would appear to depend either on the stage in which it is observed, or on the relation which it bears to the peritoneal serous surface. Thus

[1] Murphy, A. J. of O., vol. 49, p. 205.

Sicks (C. f. Ch., 93, 447) 25 per cent were secondary to infection of genitourinary tract; 65 per cent secondary to a bowel infection. In children the main source is the mesenteric glands (Rolleston, loc. cit., 569).

[2] While the path of infection is most commonly from an organ opening *from without into* the peritoneum, it is not unusual to find an infection of such organs secondary to that of the more internal structure (Fenger). Thus peritoneal ulceration not infrequently finds its way through the intestinal wall into the bowel, and the Fallopian tube occasionally furnishes the channel by which tuberculosis is conveyed *downward* into the uterus.

[3] A. J. of O., vol. 49, p. 26.

in the acute *disseminated miliary form*, occurring first through hæmic infection and then through continuity of surface, the lesion is flat and superficial, as in certain forms of lupus; the primary result, a more or less protective irritation of the remainder of the peritoneum, causing *ascites;* the secondary and terminal result, if the process is benign, *fibrous or cobweb adhesions* due to cicatricial healing — *obliterative peritonitis* (see cases 3 and 5). Many spots of peritoneal tuberculosis stop here and never even reach a deep or cheesy stage, but undergo a healthy cicatrization direct from the flat tubercle. If the process is not benign, or if it is primarily in the deeper tissues, as in infection from contiguous organs through lymphatic spaces, it takes on or passes into an *ulcerative or cheesy form*, thicker, and resembling a more deeply placed lupus. In this form we observe all the usual phenomena of chronic tuberculosis: *fibrous nodules*, great *fibrous bodies*[1] surrounding *cheesy masses*, partly *cicatrized ulcers*, *encysted deposits* of varying size and consistency, masses of *exuberant granulation tissue* slowly undergoing fibrous change, and finally *obstructing bands* of deep fibrous tissue — the completed product. Here should be grouped also, not only the more or less *encysted dropsies* of the general peritoneum, but those rare *pseudocysts* forming in the pelvis — taken invariably for true cysts of the genital tract, but under the microscope proving to be mere sacculated receptacles for infected tuberculous debris.[2] The *omental nodes* or *ropes* — themselves often non-tuberculous — which are found matted together in various parts of the abdomen, are also usually formed during this stage of the process, as are the isolated *cold abscesses* occurring infrequently among the peritoneal folds.[3]

Finally, where *mixed infection* occurs, either through the same channel traversed by the tubercle bacillus (Fallopian tubes) or through new channels established by tuberculous ulcerations (bowel, appendix, tube, glands), we encounter the usual forms of septic abscess joined to the tuberculous process — *suppurative tuberculous peritonitis*. Cases where the mixed infection occurs suddenly — as in acute perforation of a tuberculous appendix — do not differ clinically from non-tubercular cases, for the septic process seizes the right of way (see case 4), but where mixed infection occurs slowly and the process is walled off, the tuberculous germ again gains the upper hand, and the presence of pus micro-organisms is shown clinically only by increased pain and better defined hectic fever.[4]

We thus see that the various so-called forms of peritoneal tuberculosis are produced, merely by variations in the stage or location of an identical process, and that each form or stage represents either an advantage gained by the individual — as in absorptions, adhesions, obliterations, cysts,— or by the disease — as in ascites, ulceration, perforation, cheesy degeneration, and mixed infection with resulting hectic fever. The former processes may be characterized as usually benign, since they represent a certain tendency to return to the normal, the latter are essentially degenerative and malignant.

SYMPTOMATOLOGY AND DIAGNOSIS

It is no difficult matter to imagine that a disease which can run a course varying in different individuals, from a sharp clinical picture confined to the peritoneum alone, to one occurring extensively, and yet so quietly and so without local disturbance, as to pass unnoticed owing to more fulminant infections of other organs, should present difficulties in the way of diagnosis. This obscurity, we must concede, is everywhere the prevailing clinical characteristic of the tuberculous infection. Since we may find, pathologically, all stages of tuberculosis in every organ, ranging from cases showing the unalloyed lesion, to those showing the disease either modifying or modified by other morbid conditions, so we must expect a rarely unmodified *symptomatology* in peritoneal tuberculosis.

It may be at once conceded that certain forms of tuberculosis come invariably and legitimately as operation-table surprises.[5]

Many cases of general tuberculous peritonitis pass through the stages of miliary eruptions, ulcerations, and healing by cicatrization so

[1] As in some enormously hypertrophied appendixes illustrated by case 8.

[2] Such a rare pseudocyst was found in case 5.

[3] See case 2.

[4] Ektikos — a habit.

[5] Few of the cases recited by Murphy (loc. cit.) seem to have been identified prior to operation.

quietly that the presence of *any* disease is first recognized by *end results* not necessarily pathognomonic.

Even more, we must admit that many specimens removed at operations are not to be classified except through laboratory examination of their sections. Among these forms are those where local infection occurs through the tubes or appendix, and where the clinical manifestations of the regional trouble effectually mask the true pathology. We may, for these reasons, dismiss for the present any discussion of such local manifestations, with the statement that their diagnosis and treatment are matters to be decided by open inspection, and that any pre-operation diagnosis based on local conditions is usually altogether guesswork. For any definite picture of the symptomatology of peritoneal tuberculosis, we must look, therefore, either to those cases showing a well-defined general involvement of this structure, or to those in which systemic tuberculosis is attended by fairly advanced peritoneal lesions and symptoms.

Certain well-nourished and rosy-cheeked people develop *ascites*, with no other symptoms to indicate the true source of the condition. Suspicion would often legitimately point to a sclerosis of the liver; and it is a well-recognized fact that, in the young, tuberculous peritonitis and cirrhotic liver often, for some mysterious reason, occur concurrently.[1] In the presence of the juvenile form of hepatic cirrhosis, the surgeon is apt to be hard put to it for his differential diagnosis. After ruling out any large ovarian cyst by observing the absence of median dullness and projection, he may be able to find evidence of inflamed and retracted mesentery in an increased bowel resonance upward and to the right, or of the same condition of the omentum by the presence of an irregular mass lying above the navel and extending transversely. The evidence afforded by the presence of local or encysted bodies of fluid is especially important. In some cases tuberculous plaques are said to be felt indistinctly within the abdomen, like the wheels of an urticaria.[2] More frequently a vaginal examination will disclose painless, shifting, irregular masses of the same deposit within the pelvis. Vesical irritation is an important symptom, and shows itself in frequent and especially painful micturition assignable to no local cause. The temperature and leucocytosis in these quiet cases are rarely of a character sufficiently abnormal to arrest the attention. In three cases where the Pirquet test was used, the reaction was positive. It should be noted that this reaction is most valuable in the young, and in those cases with a minimum of temperature.

Where ascites occurs in a young and otherwise healthy individual, without cardiac, renal, hepatic, or syphilitic disease, and where the aspirated fluid is either clear or found to contain many lymphocytes,[3] the diagnosis of general tuberculous peritonitis developing from a small local focus is reasonably certain, especially if sustained by any of the symptoms just enumerated.

Let us now change the picture and consider another symptom group.

CASE 3. Pelvic tuberculosis, simulating neurasthenia with appendicitis; general adhesions; recovery through change of climate following exploratory laparotomy.

J. K., neurotic woman aged 27; of somewhat phthisical ancestry, but without pulmonary symptoms; referred by her physician for appendectomy for chronic appendicitis. She was constipated, with occasional diarrhœa; had constant slight evening temperature; chronic indigestion, flatulence, abdominal pain, and tenderness. Examination showed rigidity not confined to the right side, nor could the tenderness be distinctly localized. Pelvic organs rigid and tender, but no mass. The most probable diagnosis appeared to be chronic tuberculous peritonitis.

Operation. Abdomen contained a little clear fluid with many adhesions and a moderate number of free tuberculous nodules on the bowel and mesentery. The adhesions were especially marked in the pelvic region, and the pelvic organs were so matted together by old adhesions that it was thought best to leave them undisturbed. The appendix was normal. The abdomen was closed after thorough sponging. The patient made a good recovery, the condition of the bowels improved, and after three years' stay in the Rocky mountains her health was reported excellent, with no abdominal disturbance.

In these individuals — usually under 35 years of age — a history of local pain or disturb-

[1] Rolleston, Osler, v, 569.

[2] The writer confesses that he has never been able to elicit this symptom. In point of possibility it is strongly suggestive of that other contention, formerly made by enthusiastic cholelithotomists — that gall-stones — and even the hardened portal vein — can be felt through the abdominal wall.

[3] Osler.

ance may suggest an obscure antecedent affection of the bowel, pelvis, or appendix, but there is, and has been, little or no fluid to be felt in the abdomen. The patient shows the effect of malassimilation to be traced apparently to the intestines, and there is difficulty in adjusting the bowel movements between extremes of diarrhœa and constipation. Gas pains are frequent, vesical irritation is apt to be present, and the abdomen is tender and rigid, but not locally, and there is often a certain indistinct but suggestive bogginess. Such patients show a moderate and brief evening rise of temperature (99.5–101) with a correspondingly mild leucocytosis. The status of the patient is chronic, and fails to yield to ordinary measures. Night sweats are hardly apt to occur, but the patient slowly loses appetite and flesh, and the menses become scanty. If the surgeon is fortunate, he may be able to discover irregular lumps in the pouch of Douglas or in the abdomen above the navel, although the rigid muscles make the results of examination uncertain. It may not be possible to elicit some of the more important objective symptoms just enumerated, and in their absence the surgeon is sorely tempted to classify the case as hysterical or as "intestinal indigestion," but the careful and repeated use of the scales and the thermometer, and systematic abdominal and pelvic examination should eventually enable him to be reasonably certain of a diagnosis. The confirmatory evidence offered by a positive Calmette or Pirquet test should not be neglected. It is hardly necessary to indicate that in the presence of such obscure symptoms, the possibilities of error are many, and call for great caution in expressing positive opinions. If such an abdomen be opened under a correct diagnosis, there will be found a scanty but clear fluid, many tubercular plaques, and many adhesions, both recent and old, varying from those which are dense and obstructive to others which are soft and mucilaginous ("slimy"), but all grouping themselves around, and radiating from, some original focus of infection. It is not likely in the absence of well-defined hectic, that deep ulcerations or large abscesses will be encountered, although cold pelvic or glandular abscesses formed around cheesy deposits may develop without pronounced temperature (case 2).

Symptomatology like the foregoing, if allowed to develop still farther without operation, finally reaches one of several terminal points. Most frequently the clinical necessity arises of following the history backwards from, and not forward to, a crisis, since the early stages are often traversed without attention or recognition from the physician. Such cases become critical and the symptoms throw aside more or less of their latency, through the appearance of general tuberculosis, of *cystic tumors*, of obstruction through *cicatricial bands*, or of *deep ulcers, with mixed infection* and abscess.

Case 5 had been operated for ascites and apparently cured, was subsequently operated for obstruction and again relieved. During the ensuing year and a half her health seemed to have been entirely restored, at the end of which time she suddenly reappeared with obstruction, local mixed infection, and a large cystic tumor — all announcing themselves coincidently.

When these patients come unheralded, and often in apparent good health, to the surgeon, a close study of the previous history is frequently the only way to reach even a probable pathological diagnosis. Especially in the recognition of the real origin of certain local cysts and obstructions, and in purely *local* infections (cases 4, 5, 8) through the tubes or appendix, the microscope alone can clear the true pathology. The salient, and often the only symptoms, must obviously be those of the local and acute condition, unless frank tuberculosis exists in other locations.

Case 4. Appendicular tuberculosis; mixed infection; perforation; acute peritonitis, followed by secondary tuberculosis of peritoneum; drainage; temporary fæcal fistula; obstruction; complete recovery after second operation.

T. A., woman aged 24; sallow and unhealthy in appearance; history of several attacks of colic. Present attack of eight hours' duration and attended with severe pain, vomiting and constipation; temperature and pulse normal; abdomen not rigid, and through the lax walls could be easily felt an enlarged and erect appendix; operation refused; after 24 hours, temperature rose to 100; abdomen became rigid, pain increased; leucocytes 18,000, with 87 per cent polymorphonuclears.

Operation. Peritoneum contained much free fæcal pus, especially in pelvis; no peritoneal tuberculosis; appendix non-adherent, with two perforations through ragged ulcers; cæcum also looked badly; appendix removed; cigarette drainage after sponging. In four days a fæcal fistula developed, which remained fæcal

for two weeks and finally closed after five weeks. Evening temperature ranged constantly between 100 and 102. After seven weeks complete obstruction developed. A second laparotomy disclosed dense fibrous adhesions, with a number of spots of cheesy degeneration. No fistulous communication with the bowel was discovered. The adhesions were carefully separated, iodoform was used freely, and a few slips of iodoform gauze were introduced to be withdrawn after two days. The patient recovered slowly, but is now in apparently good health, neither constipated, nor showing any evidence of general or local tuberculosis. Examination, gross and microscopic, showed appendix to be tuberculous.

But where pseudocysts and obstructions, and — *a fortiori* — mixed infections, occur in consequence of chronic *general* peritoneal tuberculosis, there can hardly fail to be a continuous symptomatology dating back to the usual preliminary stages of exudation and ulceration. In such cases a history of chronic abdominal pain and tension, emaciation, night sweats, indigestion, mucous or purulent diarrhœa, intermittent obstruction, and subacute or chronic fever, occurring in a young person is more than suggestive, and the added presence of irregular masses within the abdomen, or of tuberculous deposits elsewhere, would hardly allow of more than one diagnosis (cases 1 and 5).

CASE 5. Tuberculous peritonitis with ascites and adhesions; recurrence and secondary operation; second recurrence in the form of a tuberculous pseudocyst, communicating by a fistulous tract with the bowel obstruction; third operation followed by fæcal fistula; fourth operation for cure of fistula; recovery.

R. J., aged 22; was operated in 1906 for tuberculous peritonitis with adhesions; nothing removed; no drainage. In eight months she was operated again for obstruction, making a good recovery. After six months several large joints and one lung became involved in an apparently tuberculous process; no operation; weight 105. She was sent to the mountains, apparently to die, but at the end of one year returned in exuberant health, weight 130. No examination of abdomen made at that time. After six weeks, obstruction developed, with septic temperature and acute symptoms. Near sigmoid was a globular and tender swelling, about the size of an infant's head at term.

Operation. Median incision revealed dense adhesions surrounding a tumor rising from the left pelvis; no evidence of tuberculosis anywhere in the peritoneal cavity. The tumor was dug out of the pelvis and separted from the rectum and sigmoid, during which process a fistulous communication between the tumor and colon was torn through, and a quantity of brownish fæcal fluid escaped. After removing the tumor, the bowel was closed with Lembert stitches, and the cavity was drained with cigarette drainage through the abdominal wound. After five days a fæcal fistula developed through which the entire bowel contents escaped for two weeks. Under a dry diet, accompanied by elevation of the pelvis, and pad pressure over the fistula with injections of Beck's paste, the fæcal discharge diminished, but a fourth operation was subsequently required to close the fistula. At the present writing the patient is in apparently good health, and the fistula has closed.

Examination of specimen. The cyst was irregularly globular and about the size of an ordinary cocoanut; without pedicle, and without any endothelial layer. The sac wall was very thick and uneven, and made up of layers of fibrous tissue — organized fibrin — in which were found embedded not only the tube and the ovary, but numerous microscopic foci of tuberculosis. The cyst communicated, by a tortuous passage, with a ragged opening in the bowel, and was evidently the result of deposits of protecting fibrin around a perforating tuberculous ulcer of the colon.

Mixed infection, as a final stage, occurs in general peritoneal tuberculosis consequent upon appendicular or tubal abscesses, deep bowel ulceration, or injudicious drainage. As in tuberculosis elsewhere, if the infection is extensive, the termination is usually fatal. Such cases (1, 6, 7, 8) show continued high fever, always of a hectic type — high leucocytosis, emaciation, a tense, tender swollen and tympanitic abdomen, and purulent diarrhœa or obstinate constipation. There may be local points of increased swelling and tenderness, and chills or chilly sensations. There are apt to be the usual remissions in temperature and symptoms, characteristic of septic fevers. As a rule, where the bowel ulceration is so deep as to cause chronic perforation and mixed peritoneal infection, other organs are involved, and either the tuberculous or the pyogenic bacteria, or both, are apt to be present in the general circulation. In these cases enormous collections of walled-off pus are sometimes found — usually in children — occupying even more than one-half of the cavity — true localized *empyemas of the abdomen*,[1] and developing from one or more perforating foci. Such cases often terminate in pyæmic infarcts of other organs, and are not infrequently taken for typhoid fever.

CASE 6. Tuberculous empyema of peritoneum from unknown local focus; orbital embolism; meningitis; death.

[1] Pyoperitoneum — Murphy.

Boy aged 10, seen during fourth week of a low fever, called "typhoid." Entire right half of abdomen dull, boggy, and fluctuant, no rigidity. No blood count; temperature hectic, A. M., 99, P. M., 103. Persistent diarrhœa gave color to typhoid theory and the physician, making his calls in the afternoon, failed to detect morning remissions in temperature. Incision evacuated three pints of curdy, sweetish pus, containing bacon fat slices of organized fibrin; appendix not involved; many large fluctuating glands could be felt in the space behind the peritoneum, but the source of the abscess was not located. The abscess was walled off from the true peritoneal cavity, which was crowded to the left of the median and within which the bowel remained active. Two days later an embolus lodged in the ophthalmic artery followed by orbital abscess with meningitis and death.

More commonly the abscesses are multiple, and represent conterminous perforations of several widely separated ulcers, with many other shallower ulcerous surfaces throughout the peritoneum in various stages of healing or degeneration (see cases 1 and 7.)

If *fæcal fistulæ* form, the drainage appears to exert a quieting influence on the local process, since many fæcal fistulæ do not remain tuberculous; and in some instances a small, quiet fæcal fistula is attended, temporarily at least, with great improvement in the general health. This, however, cannot be stated as a universal rule, but only as calling attention to the fact that, for more reasons than one, a tuberculous fæcal fistula is often best treated by the surgeon when left severely alone (case 7).

Many cases of apparently simple appendicitis and salpingitis are followed by prolonged convalescence, with chronic fæcal or other fistulæ to bear witness to the fact that the parts concerned in the technique were not healthy enough to stand the strain of the stitches, etc. A study of the history and temperature charts of these cases, and more especially the careful and routine study in the laboratory of all specimens removed at operations, will often demonstrate that the original lesion was tuberculous. This fact was noted by König — the great master of tuberculosis — and receives renewed confirmation in cases 7 and 8. Cases of fæcal fistula not actively tuberculous, and with an unobstructed fæcal current, show no evening rise of temperature.

On the other hand, we cannot question the fact that tuberculosis appears oftentimes to develop on a soil prepared and weakened through the struggle with some other infection. Especially true is this of those cases where gonorrhœa has invaded the peritoneum of women who tend through "diathesis" to tuberculosis.

CASE 7. Gonorrhœa; pelvic abscess; pelvic tuberculosis; general tuberculous peritonitis; drainage; fæcal fistula; reparative operation; death.

Mrs. F. R., 26; two children; tuberculous family history; no demonstrable tuberculosis anywhere on first examination; operated for lacerated cervix in January, 1904, at which time there existed some uterine retroversion, with adhesions; recovery good but slow.

Shortly thereafter husband contracted gonorrhœa, which was communicated to the wife. In April, a pelvic abscess was drained through the vagina. In June, abscess re-formed, and was redrained in same way; pelvis was filled with a solid mass, with the exception of abscess in Douglas pouch; laparotomy in July disclosed well marked tuberculosis, involving appendix, ovaries, tubes, peritoneum and several spots in bowel; abdomen contained some clear fluid. Drainage. After six days fæcal fistula developed from appendicular stump. In September a second laparotomy was made, hoping to find the bowel healthy enough to warrant closure. Peritoneum was dry, but dotted with ulcerating tubercles. Retroperitoneal glands were swollen, and in the cæcum were two unhealthy tuberculous ulcers. A portion of the cæcum was resected, but in five days fæcal discharge returned, and continued for eleven months, during which time the evening temperature was rarely below 100. In August, 1905, she returned from the Ozark mountains in very fair health and flesh, but with the fistula still open. She urged an operation and it was reluctantly undertaken, but on entering the abdomen the hopelessness of the undertaking became manifest; the four unhealthy bowel openings were blocked merely by a dam of cheesy granulations, which also filled the pelvis, and through which sinuses passed in several directions between coils of tightly adherent bowel. The abdomen was closed and the patient, shortly thereafter, died of exhaustion and pulmonary tuberculosis.

TREATMENT AND CHOICE OF CASES FOR OPERATION

It cannot be denied that many cases of tuberculous peritonitis tend spontaneously toward recovery. In truth in no part of the body do we see so many examples of spontaneous or slightly assisted cures of tuberculosis as in the peritoneum. This fact has been conceded by König, and reiterated by Borchgrevinck[1] and Fenger,[2] so that farther confirmation would

[1] Grenzgeb. d. Med. u. Chir., 1900, also Bib. Med. Stuttgart, 1901, Abth. E, heft 4. Borchgrevinck's figures are preposterous. He states that 60 per cent recovered after operation and *82 per cent without operation*. After noting, however, the method by which his statistics are constructed, the result is not so startling. He states that "almost all cases of so-called 'simple peritonitis' are demonstrably tubercular." This liberal view as to what constitutes tuberculous peritonitis brings the mortality down to a level not far from that of severe cases of measles.

[2] A. of S., Dec., 1901.

appear unnecessary. Accepting the modern theories of opsonins and phagocytosis, it is not difficult to believe that many individuals are blessed with such exuberant resistance that any bacterial life seeking to colonize within their peritoneum may perish after a short struggle. Such are the cases in which the bacilli are supposed to be drowned in a copious ascitic fluid, or smothered and starved out by dense adhesions. Fenger admits that spontaneous recovery is also possible even after deep ulceration. With a generous peritoneal blood supply, mobilized almost anywhere through the motility of the omentum and the bowel, the circulation avails itself of often overwhelming resources at the invaded point.

That the conflict can be carried on for a lengthy period to a finally victorious termination, and with no other surgical assistance than that offered by the removal of the principal focus, is very beautifully shown in case 8. In this case, after removal of the appendix, the temperature range continued for weeks from 99–102 with a leucocytosis of 27,000 to 48,000, terminating in gradual defervescence and restoration to complete health.

CASE 8. S. R., delicate boy of 10; good family history; several previous attacks of appendicitis; came in from the country, where he had been sent for his health. The present attack was of three days' duration; pain; vomiting, constipation, rigidity, tumor at McBurney's point, P. M. temperature 102, leucocytes 20,000.

Operation. Abdomen contained some clear fluid. The tumor was an old chronic appendix, of such enormous thickness that it was at first taken for a loop of small intestines. The appendix was enclosed by dense adhesions protecting several perforations; at its origin is was of normal caliber, but it was 12½ cm. in length and 4½ cm. in diameter at its thickest part. Section showed it to be composed of dense fibrous tissue, surrounding numerous cheesy foci and points of tuberculous ulceration. After operation temperature ranged for twelve weeks from 98 A. M., to 102 P. M.; leucocyte count 27,000 to 48,000. The urine contained a large quantity of indican for many weeks. After eight weeks obstructive symptoms developed, and the abdomen was reopened in the expectation of finding not only adhesions, but an abscess. No abscess was found, but there were many adhesions, and many fresh deposits of scar tissue, showing that the process of recovery from a general tuberculous infection was progressing favorably. Although recovery was prolonged it appears to have been complete and permanent, for after five years the patient is in apparently perfect health.

Although it must be conceded that spontaneous recovery is often possible, a careful study of statistics has convinced most of our modern surgical writers, of the incorrectness of the contention of Borchgrevinck that as many cases are cured spontaneously as can be relieved by operative measures. Taking all classes of cases, it is probable that not more than 40 per cent recover under the best medical care, whilst under a conservative surgical treatment, probably 60 per cent or more become permanently rid of peritoneal infection. In many instances, without doubt, the operator has been thanked for the cure which the patient has really owed to nature, but there is still a wide statistical margin in favor of the results of conservative operative treatment. In this connection it may be noted that Munro[1] apparently misapprehended the late Christian Fenger in the following: "Fenger has stated that 50 per cent of all cases are curable under medical treatment, but this is often at the expense of much time, invalidism, and money, and he failed to realize that of the remaining 50 per cent not curable medically, probably one-half could be benefited or cured by operation." In this view of Prof. Munro, probably all of us will concur, but it is only just to the memory of Dr. Fenger to say that a careful perusal of his article[2], read before the Chicago Surgical Society in 1901, and to which Munro undoubtedly refers, will convince the reader that he held substantially the same views as his critics with reference to the curability of "one-half the remaining 50 per cent." His article was a very catholic and scientific resumé of the current literature of the subject and hardly an expression of personal adherence to either side of the controversy. The real view which Munro criticises was that held by Borchgrevinck *and quoted by Fenger.*

When a careful distinction is drawn between those cases which will spontaneously recover and need no operation, those which will inevitably die and can be helped by no operation, and those which can and should be helped only by surgical measures, the following grouping appears rational:

1. Cases where there is moderate ascites, or

[1] Keen, Surg., III, 751.
[2] A. of S., Dec., 1901.

suspected tuberculous peritonitis, but without well defined symptoms, should be given a trial of diet, climate, hygiene, etc., as recommended by Borchgrevinck,[1] for a reasonable time (4 to 6 weeks! Shattuck[2]) before operative interference. This course should also be followed — but for a more extended period, on account of the increased danger of fæcal fistula following operation — in cases which are surely secondary to intestinal tuberculosis.

Where operative measures have already been instituted, they should be followed promptly by this same systematic treatment with diet, hygiene, and climate. In the extremely favorable recovery made, after operation, by cases 3, 5, and 7, and in the marked temporary improvement in case 6, I am satisfied that the result was due as much to the subsequent slower influence of climate and diet, as to the necessary and preliminary operative interference at the critical moment.

2. Operation should be positively withheld (*a*) in those cases where there is well marked constitutional tuberculosis; (*b*) where there is extensive and general ulceration and mixed infection of the peritoneum, with or without abscesses or fistulæ; (*c*) where the general system is from any cause so badly depleted that there can be no reasonable hope for surgical repair. It must be remembered that the tuberculous patient — unlike the patient with cancer — lacks resistance even in uninfected tissues, and that the natural tendency of operation wounds in such patients is to participate hopelessly in the tuberculous process. No brilliant, though temporary, restoration to life, such as frequently occurs through taking surgical advantage of the recuperative power of the patient with cancer, can possibly occur in the case of the patient with advanced tuberculosis, in whom the prompt reparative energy necessary after resection and anastomosis, or even after extensive suturing or curettements, is completely lacking. (*d*) Tuberculous patients with general visceral adhesions and without ascites probably receive little benefit from laparotomy *per se*, except as it furnishes an opportunity for the removal of foci of local infection, or for the treatment of adhesions which are the cause of acute obstruction.

[1] Loc. cit. [2] A. J. of M. S., 1902.

3. Operation is especially recommended in the following groups:

(*a*) After a reasonable but unsuccessful trial of medical and other measures in the cases mentioned under group 1; nor should this trial be too long continued, for, by withholding operation until medical treatment is hopeless, we supinely allow the disease to pass from the favorable exudative and ascitic stages to the unfavorable one of ulceration, adhesion, and mixed infection. "Such delay puts upon surgery altogether too great a burden."

(*b*) Cysts, local abscesses, and chronic obstructions occurring as incidents in the progress of cases tending otherwise toward spontaneous recovery, call loudly for operative interference. It may also be necessary not to withhold operation, in emergencies, on certain obviously short lived patients who are suffering from the same — but acute — conditions.

(*c*) Interference is also advisable for local tuberculous manifestations in and around the tubes and appendix, and at other points where this disease can be recognized as local; or where local disease of any kind has gained a foothold, even though it requires the operation to demonstrate that it is tuberculous.

We may as well admit here — as has, indeed, already been elsewhere hinted — that cases in group (*c*) are usually operated for causes quite apart from any prior consideration of tuberculosis, and oftentimes in complete ignorance of the true pathology of the invasion. This does not, however, alter the fact that such instances should here receive their proper statistical grouping amongst those which can be cured by operation, since it is beyond controversy that the majority of cases of tuberculous peritonitis spread by continuity from just such unrecognized local foci.

Where operative interference is undertaken it should be with a clear idea of the indications to be met. These are stated by Murphy with classic brevity:

1. To remove diseased products.

2. To remove the source of these products where possible.

3. To encapsulate such foci as cannot be removed.

4. To escape mixed infection.

These indications can only be adequately

met by *open incision*. Were the mere removal of ascitic fluid of any real advantage, it should be sufficient *to tap* the patient, as was the practice up to 1884 and even later. In fact, Borchgrevinck as late as 1901 intimates that, although the exudate returned in 15 out of 19 cases which were tapped, it subsequently disappeared in all but 4 of the 15. These figures — like most of the others offered by Borchgrevinck — hardly agree with those of other writers, amongst whom there is unanimity of opinion that simple tapping is not only unproductive of good, but — in many instances — of positive injury to the patient.

We must look beyond the mere withdrawal of fluid for an explanation of the relief attained by an operation in these cases. That some active, different, and more than usually effective therapeutic agency is called into service is reasonably evident. The fact that this agency fails to check the disease after it has spread beyond peritoneal limits, or that it often fails of relief where mixed infection has invaded the abdomen, does not lessen the value and correctness of the observation that *incision*, thorough *evacuation*, and *primary closure, without drainage*, will effect a prompt permanent cure in a majority of cases of miliary peritoneal tuberculosis[1] which have not advanced beyond the stage of ascites.

How this cure is effected is one of the accepted mysteries of this always puzzling disease. The following theories have been offered by way of explanation:

1. The admission of light and air, and the withdrawal of a moist medium, introduce conditions unfavorable to farther bacterial growth. This theory undoubtedly accounts partially for a certain percentage of the cures.

2. The escape of fluid containing a high percentage of ptomaines and of a correspondingly low opsonic index, makes a place for fluid of higher resistance and purer quality. This may be all true enough, but such replacement could be just as effectively accomplished by tapping; and furthermore, improvement is most likely to occur in those cases where the fluid is never renewed.

3. Various versions of an apparently identical theory: change in intra-abdominal tension, causing a favorable hyperæmia (an application of the Bier principle); opportunity for peritoneal overgrowth; collapse of distended peritoneum favors protective adhesions around original foci.

It would appear to the writer that the most plausible explanations for the phenomena of cure in these cases are grouped under 1 and 3, and that the thorough evacuation of the ascites is essential to a cure only because it is succeeded by the following steps: (*a*) close coaptation of surface; (*b*) active hyperæmia following withdrawal of intra-abdominal tension; (*c*) formations of protective adhesions; (*d*) resorption of tuberculous masses and disintegration of the bacilli. In these curative processes the *adhesions* seem to be a normal and necessary element, although some of the more superficial lesions never form adhesions, but heal probably by a process not unlike that occurring cutaneously "under a soft scab." This explains why recovery does not more frequently follow simple tapping, why the free sponging of the dried cavity is held by many operators to increase the probability of cure, and also why recurrence of the ascites prevents or delays recovery.

The most important therapeutic lesson to be derived from a study of statistics and experience, is that *drainage should be only a dernier resort in every case*, and should be avoided whenever there is any other avenue of escape. Bottomley's report (Boston City Hospital, Reports, 1900, pp. 118 et seq.) of 28 cases shows that of 18 drained cases 5 were followed by fæcal fistula.[2] In 10 of Bottomley's 11 fatal cases drainage was employed; only a single one of 11 undrained cases died. This is abundantly confirmed in my own experience, where all the fatal cases were drained; in addition there were 4 fæcal fistulæ after drainage — two of which were slowly fatal — out of 8 cases.

Gauze drains appear to be particularly mischievous where they are inserted after extensive separation of adhesions.[3] Nevertheless, in the face of a liberal mixed infection, with peritoneal ulcers and large pockets of dirty pus,

[1] "In the ascitic form the improvement is startling and immediate." Moynihan, Surgl. Operations, 1905, p. 89.

[2] Loc. cit., p. 233.

[3] Czerny.

it would take great courage to follow the advice of Murphy to evacuate and close primarily without drainage. Where the cavity refills, Murphy advises *secondary aspiration* with injection of a glycerin-iodoform-formalin mixture.[1] This advice, it would appear, is based on an application of the principle of *laisser faire* to lesions which cannot be eradicated; and yet the advantage of the idea of immediate closure would hardly seem to hold where there are large mixed infections of tubal, intestinal, or appendicular origin, even though their etiology is partly tuberculous. These abscesses may often be cleaned rapidly, yet effectively and quite harmlessly, by the insertion of twisted or folded wicks of gutta percha tissue.

More universal in its availability is the advice given by Fenger that curetting, excision, suture, and dissection of tuberculous masses within the peritoneal cavity, is bad surgery, and should be avoided. Equally valuable is his warning against attempts to close tuberculous fæcal fistulæ by radical measures, although he cites one of his own cases in which a partial cure was thus effected. This warning was confirmed in case 6, where a woman with improving health and an insignificant fistula died after attempted closure. A more successful method, recently practiced in case 5, is to keep the patient in bed on a dry diet, injecting the fistula from time to time with iodoform or boric jelly, using enough to allow a little of the hardened jelly to appear in the next stool.

Fenger's warning against adopting too radical measures against tuberculous foci must be held to apply especially to those lying among the intestines, and in places where the technique of their removal would require reparative processes beyond the powers of the individual. The drainage of such abscesses is especially apt to be followed by serious fæcal fistula.

Where the appendix is tuberculous, and where enlarged glands are easy of access and the patiently reasonably strong, and where the tubes and ovaries are still free and active, and serve as disseminating depots of the disease, there is but one course to take, and that is to extirpate any visible tuberculous focus. But it is questionable whether there is any justification in digging up quiet old adnexa which have been long buried in protecting adhesions.

[1] Of these 4 died and one recovered. No case of Bottomley's died as the direct result of the operation and no operation seemed to do harm. Definite cures after the lapse of one or more years, occurred in 40 per cent of all cases, with an equal number of deaths; among the remaining 20 per cent were 2 improved and 4 untraced.

CONCLUSIONS

In reviewing the foregoing paper certain points seem to fix themselves as worthy of more than ordinary attention:

The apparent difference in the incidence of peritoneal tuberculosis in the male and female is apparent rather than real, and such difference as exists is due altogether to the inclusion of the female organs within the peritoneal cavity.

The apparent differences in the form of peritoneal tuberculosis are due: 1st, to differences in the location and structure of the organs involved; 2d, to a recognition of the disease at various stages in its development. Pathologically, the disease has but one form, which unfolds itself along the same morphological lines as in other parts of the body.

Peritoneal tuberculosis is never primary. The most common avenue of entrance is the bowel; next, the lymph glands; next, the female genitals.

Bowel infection may be secondary to that of the peritoneum, and the female genitals may receive infection in the same retrograde manner.

Gravity plays an important part in the spread of intraperitoneal tuberculosis. The same is true of diffusion by contact and continuity.

Temperature of a markedly febrile character is an indication of mixed infection. Especially true is this of *remittent* fever.

High leucocytosis and temperature following operative interference are favorable conditions, and indicate good resistance of the individual to the farther progress of the disease.

In abdominal operations followed by prolonged fever and delayed convalescence, the possibility of the existence of hitherto unsuspected tuberculosis should be carefully canvassed by the operator.

All specimens removed at abdominal operations should be thoroughly inspected for tuberculosis.

The theory that ascitic fluid has a protective,

curative, opsonic, or otherwise salutary function is incapable of proof. The notion is evidently another survival of the old-fashioned "argument from design," which once was satisfied to see in all of nature's processes the operation of certain forces tending automatically toward recovery. In all those cases where recovery takes place, healing occurs after the resorption of the fluid and through the agency of active hyperæmia and adhesions; the fluid exudate is a step away from recovery, the adhesion is the force which, here as elsewhere, delimits and excludes the morbid process from becoming a farther power for evil. In this simple explanation we can trace, without mystification, the process by which nature, assisted merely at a crucial point by complete surgical evacuation of the fluid and complete collapse of the cavity, is enabled to effect a cure which would otherwise have been either impossible or long delayed.

Statistics, approved by the best modern opinion, show that simple incision with thorough evacuation of the fluid without drainage, increases by a very appreciable percentage the certainty and rapidity with which climate, hygiene, and diet can effect a permanent cure.

König's analogy between the joint and the peritoneal cavity was a brilliant inspiration and led to the practice of treatment by incision and evacuation. But, like most analogies, it fails of deeper meaning — in other words it is not a true homology — when we undertake to to accept it as a guide for the treatment of the intimate details of peritoneal tuberculosis.

Radical operations, such as curettage, erasion, resection, continued drainage — quite beneficial in joint surgery — should have no place, except as emergency measures, in dealing with the intraperitoneal lesions of tuberculosis.

Drainage is a "snare of the devil" and is especially apt to be followed by serious and often fatal fæcal fistula in the dry forms of tuberculous peritonitis. Statistics show conclusively that its practice leads to evils which are worse than the original disease.

SPONTANEOUS RUPTURE OF PYOSALPINX INTO THE GENERAL PERITONEAL CAVITY, PRODUCING ACUTE DIFFUSE PERITONITIS[1]

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THAT spontaneous rupture of a pyosalpinx or tubo-ovarian abscess into the general peritoneal cavity, producing acute diffuse peritonitis, is a rare occurrence, is attested both by the paucity of cases in literature and the experience of surgeons who have done a large amount of abdominal work. In view of the pathology of suppurative tubal disease, however, its rarity is not surprising, as the morbid process within the cavity of the tube generally extends through its walls and produces a perisalpingitis, which, as a rule, results in adherence of the tube to those structures which come in contact with it, notably the peritoneal covering of the pelvic walls, the rectum, and the bladder. In some cases, too, the passage of micro-organisms directly through the fimbriated end of a leaking tube gives rise to a localized inflammation, which not only serves partly or completely to close the opening at this extremity, but also effectually to bind down the tube and wall it off from the adjoining area of the peritoneal cavity. If the fimbriæ are not all drawn into the lumen of the tube, further leakage may take place, producing still greater inflammatory changes. Such an occurrence, and ulceration through an adherent portion of the tube, are responsible for the formation of many pelvic abscesses, those walled-off purulent collections which Dr. Joseph Price has so appropriately termed cesspools of pus. Similar and identi-

[1] Read before the Northern Medical Society, Philadelphia, September 24, 1909.

cal conditions may be brought about by the migration of bacteria through the walls of the tube itself, or their passage through some portion of the bowel to which the former has become adherent. So, too, infection passing through the mesosalpinx may eventually lead to the formation of small abscesses between the folds of the broad ligament. In some cases the inflammation seems to expend itself upon the tubal walls, so that the organ becomes thickened, distorted, and its cavity practically obliterated.

It is evident that the supervention of any of the changes thus far mentioned tends rather to prevent involvement of the general peritoneal cavity than to favor its occurrence. If in lieu of these changes the tube becomes distended, forming a suppurating cyst-like body, free or only slightly adherent to contiguous structures, the condition is one which endangers the integrity of the peritoneal cavity, providing rupture or continued leakage take place. Omitting all discussion of the pathogenesis of sactosalpinx purulenta, I will proceed to a consideration of the former accident, which forms the subject of this paper.

The individuality of the accident must be recognized. It is a phenomenon analogous to the perforation of an inflamed appendix, a distended gall-bladder, or a typhoidal ulcer of the intestine. Its sequelæ are to be distinguished from those cases of general peritonitis which follow pelvic peritonitis either as the result of liberation of pus from a localized focus of suppuration, or the propagation of micro-organisms through the limiting walls of such foci, or even through the lymphatics. A distinction also should be drawn between rupture of a distended tube and leakage from a previously agglutinated fimbriated end, which gives way under the constantly increasing pressure within the cavity.

I have had one case of rupture, the history of which is as follows:

The patient, a widow thirty-eight years old, first came under observation early in September, 1907, at which time she was affected with a facial paralysis of undoubted syphilitic origin. Her nutrition was poor, the arteries were hard and fibrous, and the heart's action was feeble. Under vigorous antisyphilitic treatment, however, she rapidly improved.

Little concerning her previous medical history could be learned, except that she had been infected with syphilis by her husband several years before.

About the middle of October she asked advice for pain in the lower part of the abdomen, especially in the right ovarian region; backache; a purulent vaginal discharge, and profuse menstruation. She stated that she had been troubled with these symptoms for several years, but that they had become much worse after a curettement done eighteen months previous.

Upon examination it was found that the uterus was enlarged and displaced backwards, that there was a well-defined mass to the right of it, and that there was some enlargement of the left Fallopian tube. A diagnosis of double pyosalpinx, endometritis, and retroversion of the uterus was made, palliative treatment prescribed, and the patient advised to submit to operation later, provided her general condition should become such as to justify surgical intervention. For a short time some relief was afforded by the treatment ordered, but on the 6th of November, the patient complained of increased pelvic pain and more profuse purulent vaginal discharge, the latter having superseded an unusually prolonged menstrual flow. Vaginal examination at this time revealed an increase in the size of the mass at the right of the uterus. Rest in bed was enjoined, and an anodyne internally, together with a counter irritant application to the lower part of the abdomen, was prescribed. On November 8th, the patient felt better. She had no fever, her pulse was slow, and the abdomen was not sensitive to pressure except in the right ovarian region, and even there it was only slightly tender.

On the evening of November 9th, I was hastily summoned to her bedside, being told that she had been suddenly seized with violent abdominal pain, and seemed to be dying. I found her in collapse, moaning, groaning, and tossing about the bed. Both knees were flexed, the extremities cold, the forehead covered with sweat, the abdomen rigid and painfully susceptible to the slightest touch. The pulse was 140, small, wiry and weak; the temperature was 100.4° F. In short, the clinical picture was that of a typical acute fulminating peritonitis.

From the fragmentary statements of the patient herself and the information given by her friends, it was learned that the abdominal pain from which she had been suffering during the preceding days returned very early in the morning and became progressively worse during the day, and that at about six o'clock that evening, when returning to bed from the toilet, she experienced a sudden, sharp pain low in the right iliac fossa, so excruciating as to cause her to drop to the floor, where it was thought she had lain for a number of minutes before being able to summon assistance. The pain continued to be most distressing, rapidly became generalized, and was accompanied by repeated attacks of vomiting and two chills.

Although there was no doubt about the patient's actual condition, nor any question whatever in my mind that immediate laparotomy was indicated, I was at a loss to account for the sudden onset of such violent peritoneal symptoms. While the possibility of rupture of the right tube was considered, it was thought more

probable that the appendix, adhering to the tube, had become inflamed, ulcerated, and perforated.

The patient was removed to the Methodist Hospital and operated upon at 11 P. M., or five hours after the onset of the first alarming symptoms. As soon as the abdomen was opened, an abundant outflow of seropurulent fluid occurred. The intestines were somewhat distended and considerably congested, but there were no fibrinous deposits upon them, nor were they matted together. The appendix was normal.

Passing my fingers into the pelvis, I easily delivered from the right side a large sactosalpinx, together with the ovary. The tube was the size of a large pear, violaceous in color, already partly collapsed, and presenting on its anterior superior surface, about midway between the uterine and fimbriated ends, a perforation fully three-fourths of an inch long and half as wide, from which pus was still issuing. The fimbriated extremity of the tube was completely closed. The ovary was enlarged and adherent to the tube, but had not become converted into an abscess. Both were removed, the peritoneal cavity flushed out with hot normal salt solution, a drainage tube and a strip of gauze inserted through the lower angle of the incision, and the patient sent back to bed. Owing to her desperate condition, she being apparently in extremis, no attempt was made to explore the left side of the pelvis. During the first forty-eight hours after operation, her condition remained precarious, but at the end of that time she began to improve. After the first week convalescence was uninterrupted, and she was discharged from the hospital on December 1st, three weeks after the operation.

Feeling sure that such rupture of a pyosalpinx is an unusual occurrence, and having this belief corroborated by the opinion of a number of surgeons with whom I discussed my case, I began an investigation to determine its incidence, its course, and its termination.

An exhaustive search through the literature revealed a record of thirty-one authentic cases up to June 1, 1909.

A letter was sent to fifty surgeons asking for a report of their experience with such cases. Forty of them answered. Out of this number only fourteen had ever seen the condition, and only nine could give any definite information concerning their cases. The combined cases of these nine gentlemen are thirteen in number.

Of the remaining twenty-six who replied, sixteen stated that they had never seen a case, some were unable to look up their case-records, and a few evidently misunderstood the questions and gave information concerning other subjects.

A combination of the cases obtained from the two sources, together with my own, makes a sum total of forty-five, an analysis of which yields the following data:

In the majority of the cases there was no assignable cause of rupture. In the minority of them such exciting causes as straining, lifting, traumatism inflicted during coitus, and the use of strong purgatives seem to have been operative. In some rupture evidently followed a fresh puerperal infection superimposed upon an old inflammatory process.

In thirty-one cases the manner in which the attack began and the way in which the peritoneal symptoms developed are known. In all but two of these, the onset was precipitate and violent, the evolution of symptoms rapid. Sudden, sharp abdominal pain, collapse, and the rapid development of diffuse peritonitis constitute the symptom complex. Thus it appears that the manifestations of this accident, both as to their beginning and course, resemble those of other kinds of perforative peritonitis.

These circumstances serve to distinguish it from attacks of localized peritonitis accompanying salpingo-oöphoritis, either independent of or associated with pelvic cellulitis or pelvic abscess. In several cases a diagnosis of ruptured appendix was made, and this is probably the condition with which it will most often be confounded. In a few cases it was thought that perforation of the uterus made during an attempt to procure abortion was responsible for the peritoneal inflammation. I believe that in most instances a correct diagnosis will have to be made from the history of the case, for the reason that the agonizing condition of the patient precludes all possibility of a thorough physical examination.

What is the prognosis? It is universally recognized that an outpouring of purulent fluid into the general peritoneal cavity is an accident fraught with great danger. In the cases herein studied its occurrence was disastrous. It is probable that the potentiality for evil is greater in acute puerperal cases, in those in which the tube is in close relation with the bowel, in the acute primary gonorrhœal cases, and in those in which a fresh gonorrhœal infection has been implanted upon a chronic suppurative process, than in the purely chronic gonorrhœal

cases, in which the pus is relatively innocuous, particularly if no part of the tube has become adherent to the bowel. In the cases first enumerated, the staphylococcus, the colon bacillus and a fresh strain of gonococci are the chief offending micro-organisms, in the latter principally an attenuated strain of gonococci. Unfortunately, sufficient data could not be obtained from the cases analyzed to afford any positive information in reference to this matter.

With regard to the general mortality, it may be stated that of the forty-five cases herein studied recovery took place in twenty-three, and death occurred in twenty-two, which gives a mortality rate of 48.8 per cent.

In thirty cases it was possible to determine the time which elapsed between the presumable occurrence of rupture and the operation. The results were as follows: Of twenty patients operated upon during the first twelve hours, fourteen recovered and six died. Percentage of recoveries 70, percentage of mortalities 30. One patient operated upon at the end of twenty-four hours recovered. Of five operated upon at the expiration of forty-eight hours, four died and one recovered. Percentage of recoveries, 20, percentage of mortalities, 80. Of four operated upon between the fourth and tenth days, three recovered and one died. Percentage of recoveries, 75, percentage of mortalities, 25. At first sight the results obtained in the last group of cases seem the best. In reality, however, they are entirely untrustworthy. In two cases the patient did not have symptoms of fulminating peritonitis, these being the two already referred to as the ones in which such symptoms were not present. The third patient required a second operation at the end of four weeks for evacuation of pus and removal of the debris of the tube, and a third operation two weeks later for a collection of pus in the left iliac fossa. In this connection an analysis of the cases in which operation was refused or contraindicated by the gravity of the patient's condition is of interest. One patient died thirty-six hours after the presumable time of rupture, one forty-eight hours afterwards, one seventy-two hours afterwards, two ninety-six hours afterwards, and two at the end of two weeks. Of the remaining eight patients, three of whom recovered and five of whom died, nothing could be learned either in reference to the time elapsing between perforation and operation or to the period intervening between the beginning of the attack and its fatal termination. It is known, however, that two were moribund when first seen.

Writing in 1889, H. J. Boldt stated that there was not a single case on record in which recovery took place without operation. Writing now, twenty years later, I am able to repeat that statement, and furthermore to demonstrate that the earlier intervention is practised, the better is the chance of recovery. The latter circumstance is entirely in conformity with the now generally accepted rules governing the treatment of acute perforative peritonitis, upon whatever lesion depending.

These considerations naturally lead to a discussion of the treatment to be employed. It is my opinion that every patient should be operated upon at the earliest possible moment after the onset of symptoms, and by operation I mean that the abdomen should be opened, the ruptured tube removed, and the peritoneal cavity drained. To open the abdomen and merely allow fluid to run out, is, I am convinced, an almost invariably futile procedure. In only one of the cases in which it was done did recovery take place, and in that one, two other operations had to be performed. If a patient's condition is such as to justify operation, then it is such as to warrant removal of the primary causative lesion, provided that unusual obstacles to its removal are not encountered. To leave necrotic, poisonous tissue behind is nothing more nor less than to contribute to the propagation of the peritonitis.

So likewise vaginal puncture, as valuable as it may be in the treatment of certain walled off collections of pus, would be worse than useless in the cases under discussion. What can be said in reference to waiting for the hyperacute symptoms to subside? Certainly nothing favorable, for the reason, as shown above, that almost every patient who was not operated upon during the first forty-eight hours died. In only three cases was there an absence of very severe peritoneal symptoms after that length of time. In one of these there was evidently a localization of the trouble to the pelvis. In the other two there was free pus in

the peritoneal cavity, and some, though not a violent peritonitis. While it is possible that such comparatively mild consequences as these may occasionally result, it is probable that the sequelæ will be so serious as greatly to jeopardize life. Therefore, the patient's interests will be best subserved by subjecting her to immediate laparotomy.

The conclusions drawn from the investigation of this subject may be summarized as follows:

1. Spontaneous rupture of a pyosalpinx or tubo-ovarian abscess into the general peritoneal cavity, producing acute fulminating peritonitis, is a very rare accident.

2. In the severity of its symptoms it usually resembles other forms of perforative peritonitis.

3. It conforms to the general rule obtaining in such cases, that the earlier operation is performed, the greater is the chance of recovery.

4. It is a very momentous accident, having a mortality of thirty per cent, even in those cases in which operation is made during the first twelve hours.

5. It should be considered as the possible causative agent in all cases of acute general peritonitis of obscure origin occurring in females.

6. Its proper treatment is immediate operation.

LIST OF CASES[1]

ABELL, IRVIN

The patient, a girl 17 years old, had general peritonitis when first seen, which was two days after the beginning of her illness. She gave a history of attacks of colic for a number of years. Diagnosis was ruptured appendix. At operation the right tube was found ruptured. The appendix was normal. It was learned that the patient had suffered with vaginal inflammation and discharge during childhood, and a probable history of gonorrhœal infection was elicited. Recovery.—*Louisville Monthly Journal of Medicine and Surgery*, vol. 13, 1906–1907.

BOLDT, H. J.

CASE 1. For fourteen years the patient had been troubled with pelvic pains and backache. Five years before she had been infected with syphilis by her husband. Upon examination both tubes and ovaries were found enlarged. On May 15, 1887, after violent physical exertion, the hypogastric pain became worse. On May 20th, Dr. Boldt was again summoned to see her and found her suffering from general peritonitis. Operation on May 21st. Pus was found in the general peritoneal cavity. The intestines were matted together and both tubes were ruptured. The patient died sixty hours after the operation.

CASE 2. The patient was a woman 29 years old who gave a history common to salpingitis. On April 21, 1887, she was suddenly seized with severe pain in the lower part of the abdomen which gradually became worse. After a few hours, however, it subsided somewhat until the 23d, when it again manifested itself with much greater intensity. Signs of general peritonitis rapidly developed. The abdomen was opened and the right tube was found to be ruptured. The patient died.

CASE 3. The patient was a woman 23 years of age, who for one year had had constant pain in the right ovarian region and hypogastrium. Her general condition was very poor. Examination revealed the fact that both tubes were prolapsed and enlarged. On the morning of June 12, 1887, during sexual intercourse, she was suddenly seized with a severe pain in the right ovarian region, which was immediately followed by vomiting, supervention of shock, and a generalized abdominal tenderness. She was seen very soon after the accident. There were no evidences of general peritonitis. Operation was made within two hours. The right tube was found ruptured, the perforation being two centimeters in length. There was free fluid in the peritoneal cavity, and the peritoneum was considerably congested. Recovery.

CASE 4. The patient was first seen on June 30, 1889, and was found to be suffering with a well advanced general peritonitis, which dated from a sudden attack of pain in the abdomen, accompanied by an attack of syncope. Operation was refused. The patient died July 2d. At autopsy the peritoneal cavity was found full of pus, the intestines were matted together, there was a double pyosalpinx, and the right tube was ruptured.

CASE 5. The patient was first seen for acute double pyosalpinx of puerperal origin. On July 27, 1887, she was attacked with severe abdominal pain, which began suddenly in the left ovarian region and soon became generalized. She was seen three hours after the onset of the attack and was found to be in collapse. Immediate operation. There was free fluid in the peritoneal cavity and the left tube was ruptured. Recovery.

CASE 6. The patient, a woman 20 years of age, who was first seen on October 19, 1889, was found to have double pyosalpinx. On the 25th of October she was taken with a severe chill and presented some signs of pelvic peritonitis. On the 29th she was very much better. On the evening of that day, however, she was suddenly seized with a sharp pain in the left ovarian region, which radiated all over the abdomen and soon became general. When seen, she was in collapse, cyanotic, and was screaming with pain. She was given a hypodermic injection of morphine and preparations made for immediate operation. The morphine eased her pain, and at the advice of a colleague, who was summoned in consultation, the operation was deferred

[1] Abstracted from the original reports.

until the next morning. She rapidly became worse during the night and by morning was so weak that operation was out of the question. She died on the morning of the second day, thirty-six hours after the onset of the first alarming symptoms. — *American Journal of Obstetrics*, vol. 22, 1889.

BRIN, HENRI

CASE 1. The patient was a girl 17 years of age, who had been ill two weeks before she was admitted to the hospital, having suffered with abdominal pain and vomiting. Upon admission she presented all the symptoms of advanced general peritonitis. She soon became delirious, her pulse became so rapid that it could not be counted, and she died in a few hours. At autopsy pus was found in the general peritoneal cavity, and the intestines were distended and covered with false membrane. There were no lesions of any kind upon the appendix. There was a large left pyosalpinx, which had ruptured at its anterior superior portion.

CASE 2. The patient, while ascending the stairway to her physician's office, was suddenly seized with violent abdominal pain, collapsed on the stairs, and had to be carried up. Upon examination, an irregular swelling was found in the left iliac fossa. The patient was removed to the hospital, and as she soon rallied from the collapse and presented no symptoms of general peritonitis, a guardedly expectant plan of treatment was adopted, it being the surgeon's intention to operate immediately if any signs of general peritonitis developed. She improved slowly, though steadily, and by the tenth day all constitutional disturbances had entirely disappeared. The swelling in the left iliac fossa was well circumscribed. At operation, which was made on the tenth day, a very large left pyosalpinx was found. Its posterior wall was adherent to the pelvis. When removed, it was found to be very friable. There were evidences of a small perforation upon the posterior surface in the area which had become adherent. Recovery. — *Archives Medicales d'Angers*, vol. 4, 1900.

BULLITT, JAMES B.

The patient had suffered with pelvic pain for several years. She was sent to the hospital by her physician with a diagnosis of chronic salpingitis and pelvic peritonitis. Upon admission she presented no urgent symptoms, although the abdomen was somewhat distended and she complained of considerable pain. As her general condition was poor, it was decided to defer operation until some improvement could be brought about. During the night she became suddenly worse and died at the end of forty-eight hours after her admission. At autopsy it was found that she had a general peritonitis. There was a left pyosalpinx and the diseased tube presented a large perforation. — *Louisville Monthly Journal of Medicine and Surgery*, vol. 13, 1906–1907.

CARTLEDGE, A. M.

The patient was practically moribund when seen. She was operated upon notwithstanding her condition, and it was found that the general peritonitis had originated from a perforation of the left tube. Death. — *Louisville Monthly Journal of Medicine and Surgery*, vol. 13, 1906–1907.

COTTE AND CHALIER

CASE 1. The patient was a woman aged 27 years. On February 22, 1900, after lifting a child, she felt a violent pain in the lower part of the abdomen. This was followed by vomiting, and in a few hours, when she was admitted to the hospital, all the signs of an acute perforative peritonitis were present. At the operation, February 24, 1900, a few hours after admission, the peritoneal cavity was found full of seropurulent fluid. The intestines were not adherent, and the appendix was healthy. The patient's condition was such that nothing was done except to put a drainage tube into the pelvis. She died in forty hours. At autopsy it was found that a right pyosalpinx had discharged its contents into the peritoneal cavity through a perforation near the ampulla of the tube, large enough to admit the little finger.

CASE 2. The patient was a woman aged 30 years, who, on the 3d of August, 1902, was seized with violent pain in the lower abdomen, which was soon followed by vomiting and distention. After a week's rest in bed she seemed to have fully recovered. On the 16th of August, however, there was a repetition of the previous symptoms, which came on with more intensity and developed with more rapidity and violence. On August 18th she was admitted to the hospital, presenting all the signs of an acute general peritonitis. Operation upon the day of admission. There was free fluid in the peritoneal cavity and pus in the pelvis. There was a large left pyosalpinx which was collapsed and almost empty. Near the ampulla of the tube a small gangrenous area was found, in the center of which there was a small perforation. The tube and ovary were removed and drainage made, both through the abdominal wound and through the vagina. Death occurred on August 21st.

CASE 3. A woman 26 years of age was admitted to the hospital on September 6, 1904, suffering with advanced general peritonitis. No history was obtainable. Her condition was so grave as to preclude intervention. She died a few hours after admission. At the autopsy it was found that a right pyosalpinx had ruptured.

CASE 4. The patient was a woman 26 years of age, who had been ill six days before she was admitted to the hospital. When first seen, on June 26, 1905, she was suffering from well developed general peritonitis. She gave a history of having had several attacks of pain in the lower abdomen, the last of which came on six days before her admission. It began suddenly with violent pain, so severe as to compel her to take to her bed. She was operated on a few hours after her admission. There was free fluid in the peritoneal cavity and pus in the pelvis. A right pyosalpinx was found, and a perforation one-half centimeter in length was seen on its anterior surface. The tube was not removed. Drainage was made both through the abdominal incision and through the vagina. Her condition was very precarious. On July 22d, signs of retained pus were discovered. A vaginal incision was

made through which the pus was evacuated and the remains of the tube removed. On August 5th, two weeks later, a mass in the left iliac fossa was discovered. The abdomen was opened again, a left pyosalpinx removed, and the contents of a pelvic abscess evacuated. The patient made a slow recovery and was discharged on the 13th of September.

CASE 5. The patient, a woman 36 years of age, was admitted to the hospital January 10, 1907. Following the close of a menstrual period on December 25, 1906, the patient began to experience painful micturition and felt a burning sensation in the vulva and at the anus. She stated that she did not have any vaginal discharge. She gradually developed a pain in the right side of the lower abdomen. On January 7, 1907, this pain became suddenly worse and was accompanied by vomiting. She took a purgative without result, and, on the following day, an enema, which was also ineffectual. On January 9th she took a very large dose of Villacabras water. This purgative produced a violent action of the bowels. Shortly after they moved the patient was seized with a sudden and most agonizing pain in the left iliac fossa, which was accompanied by vomiting and soon followed by repeated chills. She was admitted to the hospital within a few hours and it was found that a general peritonitis had already developed. Operation one hour after admission. There was a large quantity of seropurulent fluid in the peritoneal cavity. The appendix was healthy. On the right side of the pelvis there was a large tubo-ovarian abscess. The right tube and ovary were removed and upon examination of the specimen it was found that there were two perforations in the ovary, one of which was as large as a franc piece. — *Revue de Gynécologie et de Chirurgie Abdominale*, vol. 2, 1907.

CUMSTON, CHARLES GREENE

The patient was a woman 35 years of age, who gave a history of having had pain in the left iliac fossa for two years. Three weeks before she was seen by Dr. Cumston she had had a miscarriage. After ten days her temperature went up and the abdomen became distended. A large mass formed in the left iliac fossa. She presented a typical picture of septic peritonitis. At operation the intestines were found adherent, there was free fluid in the peritoneal cavity, and several collections of pus in the pelvis. The left tube was distended and partly adherent to the bowel. In the area which was not adherent it presented a perforation. Death. An examination of the medical history of this patient seemed to show that a year before a pyosalpinx had perforated the bowel, but that the opening had become closed. After the miscarriage the inflammation became lighted up again, and the tube burst through its free surface into the general peritoneal cavity. — *American Medicine*, vol. 4, 1902.

CUSHING, ERNEST W.

A case of rupture of a tubo-ovarian abscess into the general peritoneal cavity. Patient was operated upon the day of rupture. Death. — *Personal communication.*

DUDLEY, E. C.

A case of rupture of a pyosalpinx into the general peritoneal cavity. Operation a few hours after the accident. Complicated with rupture of the appendix. Recovery. — *Personal communication.*

EVANS AND COOMBE

The patient was a woman 39 years of age. For several years she had been subject to attacks of abdominal pain. One of these attacks lasted from February 13, 1905, to February 16, 1905. About midnight between February 16th and 17th, she had an attack of very acute pelvic pain, accompanied by vomiting and repeated chills. When seen on the morning of the 17th, her abdomen was distended and very tender, especially just above the pubes. She was rapidly growing worse. Immediate operation. A left pyosalpinx was found ruptured. The right ovary was cystic. Both were removed. Recovery. — *London Lancet*, vol. 2, 1906.

FINDLEY, PALMER

The patient was a widow 36 years of age. Criminal abortion was induced at the end of the second month of pregnancy. This was followed by infection of the uterus and both tubes. Three weeks after the abortion the uterus was curetted. Three days afterwards there was evidence of general peritonitis. The patient refused operation and died four days later. At autopsy double pus tubes were found. The left tube had discharged its contents into the general peritoneal cavity through a large perforation, causing a diffuse suppurative peritonitis. — *Personal communication.*

FRANK, LOUIS

CASE 1. The patient was suffering with a well developed general peritonitis when first seen. A diagnosis of ruptured appendix was made. Operation was not performed. Death. Autopsy showed that a right pyosalpinx had ruptured, the perforation being as large as a twenty-five cent piece.

CASE 2. The patient was operated upon for appendicitis. A right pyosalpinx was found ruptured. No data concerning the case were given except that the patient recovered. — *Louisville Monthly Journal of Medicine and Surgery*, vol. 13, 1906–1907.

GARDNER, WILLIAM S.

CASE 1. The patient, a woman 42 years of age, was admitted to the hospital late in the afternoon. The statement was made that four days before her admission she had had a severe chill, followed by a violent pelvic pain which had become constantly worse. Her abdomen was distended and tender, but the rigidity was not so marked as it often is in acute peritonitis. At operation both tubes were found to be enormously distended with pus and one had ruptured. The contents of the ruptured tube were free in the peritoneal cavity. Recovery.

CASE 2. This was almost identical with the first in every respect.

In both cases there was free pus in the peritoneal cavity, and in both there was some general peritonitis. Neither patient had, however, what could be called acute fulminating peritonitis. — *Personal communication.*

GOTTSCHALK, SIGMUND

A case of rupture of a pyosalpinx into the general peritoneal cavity. The onset was sudden and violent. General peritonitis developed rapidly. Operation was made at the end of forty-eight hours. Recovery. — *Quoted by Pozzi, Traité de Gynécologie. Reference to the original article erroneous.*

HULEUX, R.

The patient was a girl 17 years of age. Menstruation became established only four months before the development of the condition for which she came under observation. It had been absent for two months prior to the time she was seen. On November 10, 1907, she was suddenly seized with violent abdominal pain which abated somewhat only to become more severe a few hours later. It became progressively worse until the day of her admission to the hospital, November 12th. When admitted she was in collapse. The abdomen was distended and tense and was exquisitely tender to touch. A diagnosis of perforation of the appendix or intestine was made and the patient operated upon immediately. There was a large quantity of dark, dirty, turbid fluid in the peritoneal cavity. The intestines were covered with fibrinous deposits; the appendix was healthy; a mass was found in the right iliac fossa. Owing to the desperate condition of the patient, it was determined not to remove this mass. Drainage was made through the abdominal incision and also through the vagina. Death occurred in eight hours. At autopsy it was found that a tubo-ovarian abscess had discharged its contents into the peritoneal cavity through a large perforation. — *Bulletins et Mémoires de la Societé Anatomique de Paris*, vol. 9, 1907.

INGALLS, P. H.

CASE 1. The patient was in the hospital under treatment for acute salpingitis. Late one afternoon she was found in collapse. Her abdomen became rapidly distended. Operation a few hours after she was found. A ruptured pyosalpinx was removed. Drainage from above only. Recovery.

CASE 2. The patient was brought into the hospital six hours after a sudden attack of severe abdominal pain, which was followed by vomiting, rigidity of the abdomen, and considerable distention. She was operated upon three hours after admission, making nine hours after the beginning of her attack. At operation general peritonitis was found, which evidently owed its origin to rupture of a pyosalpinx. The ruptured tube was removed and drainage was made both through the abdomen and through the vagina. The patient always had a little fever after the operation, and failed gradually, dying at the end of three months. — *Personal communication.*

LEITH, R. M.

The patient was a woman 35 years of age, who was admitted to the hospital on January 14, 1907. A week before she was seized with sudden abdominal pain, from which she recovered and remained in comparatively good health until the day of her admission, when she had another seizure, much more severe than the first. When admitted she was collapsed and pallid. Her condition suggested a ruptured ectopic gestation. The lower part of the abdomen was rigid and tender. Operation upon the day of admission. The parietal peritoneum was found thickened and congested, and spots of plastic lymph were seen upon the intestines. There was a left pyosalpinx which had ruptured through the tissue of the ovary, the two being adherent. Recovery. — *South African Medical Record*, vol. 5, 1907.

MAC LAREN, ARCHIBALD

The patient was known to have an acute gonorrhœal salpingitis, and was operated upon for general peritonitis, supposed to be due to rupture of the appendix. Operation was performed on the second day of the attack. Patient died the third day after operation. At autopsy it was found that a distended tube had ruptured. — *Personal communication.*

MAC MONAGLE, BEVERLY

CASE 1. As near as could be determined, a pyosalpinx ruptured at or about the time of confinement, the patient having had an acute septic peritonitis from the time of her delivery. She died on the fourth day. At autopsy it was found that the left tube had ruptured and was discharging pus into the general peritoneal cavity.

CASE 2. The patient was a young woman upon whom an attempt had been made to induce an abortion. When first seen she had an acute peritonitis, which was thought to be due to a perforation of the uterus made when the abortion was performed. She was operated upon immediately, and it was found that the right tube had ruptured. The patient made a slow but perfect recovery. — *Personal communication.*

MANN, E. C.

CASE 1. The patient gave a history of pelvic pain for several years. She stated that it had been much worse during the three weeks prior to her admission to the hospital. When admitted it was found that she had a pelvic peritonitis. On the evening of the second day after admission signs of general peritonitis suddenly developed and became very pronounced by the next morning. A diagnosis of ruptured appendix was made. At operation the appendix was found to be normal, but the right tube presented a perforation one inch from its fimbriated extremity.

CASE 2. The patient was a woman 42 years of age who had complained of bilateral pelvic pain for three years. June 16, 1907, she was examined by a physician who diagnosticated a tubo-ovarian abscess. She was taken suddenly ill during the night of June 18th, and when seen was found to be in collapse. Her abdomen was rigid and her pulse very rapid. When examined

by her physician the pelvic mass was found to be smaller than before. A correct diagnosis was made and operation performed the same night. A large tubo-ovarian abscess was found, the ovarian portion of the sac presenting a perforation the size of a ten cent piece. Recovery. — *American Journal of Obstetrics*, vol. 56, 1907.

MILCO, V.

A case of ruptured pysoalpinx. Patient operated upon and recovered. Original article not accessible. — *Orvosi hetil, Budapest*, vol. 49, 1905.

ROCHET

The patient was a girl 13 years of age who entered the hospital because of uterine hæmorrhage. She was put to bed and kept under careful observation, it being thought that she either had miscarried, or might be about to do so. On the fifth day the bleeding stopped. Examination revealed a mass in the posterior cul-de-sac. She was prepared for operation, it being the intention of the surgeon to make a vaginal puncture and liberate the collection of pus. A dose of castor oil was given. In the afternoon of the same day the patient was seized with severe abdominal pain and vomiting, and soon developed a general peritonitis. The abdomen was opened the next morning. When the peritoneum was incised, about two liters of seropurulent fluid ran out of the abdomen. Nothing was done except to make drainage through the wound and through the vagina. Death took place in the afternoon. At autopsy it was found that the left tube had ruptured. — *Journal d'Accouchements, Liège*, vol. 13, 1892.

SMITH, A. LAPTHORN

The patient was seized with agonizing abdominal pain about 8 P. M. She was seen at 9 and the condition recognized. She was sent to the hospital and operated upon during the night. It was found that a pyosalpinx had ruptured right in the center and poured out its contents into the general peritoneal cavity, which already contained a considerable amount of fluid. Although the woman was in danger for a few days, her condition gradually improved and she made a good recovery. — *Personal communication.*

THEILHABER

The author mentions a case which terminated fatally, but gives no other details whatever regarding it. —*Muenchner Medizinische Wochenschrift*, 1905.

VANCE, A. M.

The patient entered the hospital to be curetted. Twenty-four hours later she was found in shock. Operated upon three hours afterwards. A ruptured pus tube was found. Recovery. — *Louisville Monthly Journal of Medicine and Surgery*, vol. 7, 1900–1901.

WEBSTER, J. CLARENCE

Reports two cases in which a pyosalpinx ruptured into the general peritoneal cavity and gave rise to an acute fulminating peritonitis. Both patients were operated upon within the first few hours after the onset of the attack. Both recovered, but Dr. Webster states that they had very trying experiences. — *Personal communication.*

WICOT

The patient was a girl aged 20 years who had been ill two weeks before her admission to the hospital. When admitted she had a general peritonitis. It was stated that the trouble began with an attack of violent abdominal pain. She died shortly after admission. At autopsy the peritoneal cavity was found full of pus, and the intestines adherent and covered with fibrinous exudate. There was a left pyosalpinx which had discharged its contents through a plainly defined perforation, two centimeters in diameter, upon the upper part of the posterior surface. — *La Clinique de Bruxelles*, vol. 7, 1893.

WOOD, C. S.

The patient was a woman 28 years of age who had been troubled with pelvic pain for an unknown period. On May 9, 1889, when she was first seen, she had slight fever, some tympanitis, and local tenderness over the lower part of the abdomen on the right side. These symptoms progressed. A perityphlitic abscess in course of formation was diagnosticated. On May 16th, the patient went into sudden collapse after being seized with very severe hypogastric pain. When seen she was making constant efforts to vomit and was suffering greatly. Operation on the same day by Dr. W. Gill Wiley, revealed the fact that a right pyosalpinx had ruptured into the general peritoneal cavity. The appendix was normal. Recovery. — *New York Medical Journal*, 1889.

YOUNG, E. B.

The patient was a woman 35 years of age, who, two weeks before admission to the hospital, was seized with severe pain in the lower abdomen. This was followed by a chill and fever. Rest in bed brought about an apparent restoration to her normal condition. She stated that she had felt very well until two days before her admission. A diagnosis of a right tubo-ovarian abscess was made. On the afternoon of the next day she was suddenly taken with the most excruciating abdominal pain, accompanied by vomiting and collapse, and the rapid development of peritoneal symptoms. Her abdomen was opened as soon as the surgeon could get to the hospital. Pus was found in all parts of the peritoneal cavity. A ruptured pyosalpinx was removed. Recovery. — *Boston Medical and Surgical Journal*, 1905.

OVARIAN CYST WITH TWISTED PEDICLE COMPLICATING PREGNANCY — OPERATION[1]

Report of One Case and Review of the Literature

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THE twisting of the pedicle of an ovarian cyst is an accident which, at any time, places the patient in considerable danger.

The serious nature of this complication and the relative infrequency of its occurrence in pregnancy, are the occasion for the report of the following case and the review of the literature.

Mrs. E. C.; Hosp. No. 55,446; Gyn. No. 13,054; age 32; white. Admitted to the Johns Hopkins Hospital July 1, 1906. Complained of cramps in left side of abdomen, low down.

F. H. Negative or unimportant.

P. H. General health always good; otherwise negative or unimportant. No symptoms like present illness before.

Mens. H. Began at 12 years. Regular every four weeks — not painful. Last period about three months ago. Patient thinks she is pregnant.

Mar. H. Ten years; 5 children, oldest 9 years; youngest 11 months. No miscarriages. Labors, uneventful. Puerperia, uneventful.

P. I. On the day before admission she had cramp-like pain low down in left side. It started at 7 P. M. and lasted until 11 P. M., when some relief by morphia given by physician. The next day examined under chloroform by physician, who made a diagnosis of pregnancy with ovarian tumor, and advised operation. There had been no bleeding, no leucorrhœa, no dysuria. Bowels constipated for forty-eight hours.

Exam. Patient in considerable pain. Temp. 99°. Pulse 90. Patient in good general condition, well nourished; not anæmic. Heart and lungs normal. Abdomen, lineæ atrophicæ present. Abdomen distended by a mass which rises above symphysis halfway to the umbilicus. It is indistinct in outline; slightly tender and rises slightly higher on the left than on the right side.

Vag. exam. Moderate relaxation of introitus. Marked softening of vaginal walls and bluing of mucosa. Cervix small, forward. Fundus, median line in anteposition, indistinctly made out rising half-way to umbilicus; pregnant? Posterior to the cervix a mass about 2½ inches in diameter, very tender, bulging into posterior fornix.

Exam. of urine. Faint trace of albumen. No casts.

Operation. July 3, '06. Anæsthetic: Scopolamin gr. 1-100, morphia gr. ¼, chloroform.

Median abdominal incision, uterus normal, enlarged to size of about four months' pregnancy. Intestines distended; rather dark in color, suggestive of obstruction below, but good circulation. Hand gently introduced into pelvis back of uterus, giving rise to a gush of bright red fluid, thinner than blood; and an irregular mass was felt. It was freed (some slight adhesions) and lifted up, and found to consist of an ovarian cyst from the left side, of a dark purple color, almost black. Pedicle twisted 1½ times. The tissue was very soft and friable. Removal begun at infundibulo-pelvic ligament and all the "purple tissue" removed, including a small part of the uterus. Wall of uterus bled freely. During the operation several uterine contractions were noted, but they were not marked. The oozing was checked with catgut sutures; the omentum drawn down and the incision closed in layers with catgut. There was marked thinning of the abdominal wall below the umbilicus, but no definite hernia.

Post-operative. Morphia given freely. No pain suggestive of threatening abortion. No bleeding. Out of bed on the 14th day after operation and went home on the 22d day.

Exam. on discharge. Abdominal wound healed except small granulating area at upper end (due to faulty approximation of skin edges).

Uterus. Anteposition rising to within three finger-breadths of the umbilicus.

Vag. exam. No tenderness nor thickening on left side in broad ligament.

Temp. 102.8 evening of day of operation. 101.5 on the 2d day to normal on 3d day, and following.

Through the patient's physician, Dr. A. W. McDonald, by whom she had been sent to the hospital, the following notes were obtained: "Following the operation, no pain or inconvenience. Pregnancy continued to term. Labor lasted five hours. Normal spontaneous delivery. The mother says, 'The healthiest baby of a family of six.'"

Pathological report. Path. No. 10,049. The specimen consists of an irregularly shaped cystic and blackened tumor, apparently an ovarian cyst, with Fallopian tube, which has become strangulated.

The *tube* is convoluted, thickened, and indurated, and winds over the top of the tumor. It is 12 cm. in length, varying in width from 5 mm. at the isthmus to 4 cm. at the fimbriated extremity, which is patent. It

[1] Read by invitation before the Obstetrical Society of Boston, April 27, 1909.

is apparently strangulated, but its outer surface is smooth.

The *tumor* is irregular in shape, 6 cm. x 7 cm. x 12 cm. The surface is dark, in places almost necrotic. The outer fourth of the tumor is hard and densely infiltrated, in contrast with the rest of the tumor, which is cystic.

On opening the cyst it is found to contain sebaceous material, and a quantity of dark hair. This hair arises from the wall of the cyst over an area about 2½ cm. in diameter. Elsewhere the wall of the cyst is smooth and about 3 mm. in thickness. The diameter of the cyst cavity is 6 cm. The outer pole of the tumor, the indurated area mentioned above, shows an infarct. In the tissue beneath the origin of the hair, there are masses of bone and cartilage, not definitely resembling any structure in the body. There is made out no normal ovarian tissue. The vessels in the outer part of the tumor are filled with thrombi.

Micros. exam. Tube. The tube shows a dilated lumen. The structure of the tube is masked to a considerable extent by the infiltration with blood. The vessels show thrombi. There is little round-celled infiltration, and a few polymorpho-nuclear leucocytes are to be seen.

Cyst. Fairly normal cyst wall except for infiltration with blood. No sections taken from the area of bone or cartilage.

Diag. Strangulated dermoid cyst of the ovary. Partial strangulation of the Fallopian tube. Infarcts of tube and ovary.

In a somewhat careful but not exhaustive search through the literature, reports of 113 similar cases have been found. These are presented in tabulated form. Some notes are so brief that they are of little value for comparison. The results of a study of this series of cases are given in summary.

Historical. The earliest case to which reference has been found is that of Thornton (1), who operated Oct. 27, 1875. It illustrates several interesting features in the history of the treatment, as well as the progress of the disease; so it is abstracted in some detail.

S. E., 28. Married and the mother of one child aged 15 months, was placed under the care of Mr. Spencer Wells on Oct. 12, 1875. Healthy looking woman, pregnant about four and one-half months. Abdomen occupied by a good sized cyst on the right side; and rather behind and to the left, the enlarged uterus was found. The cyst was freely movable and from the character of the fluctuation seemed to consist of one large cavity. Dr. Playfair had diagnosed ovarian tumor at King's College 14 months before, i. e., just after her confinement. Six months before the birth of her child she had an attack of severe pain, and so forth, which was probably due to the tumor. I tapped the patient by Mr. Wells' request on Oct. 19th, and removed ten pints of fluid, but evidently some small masses behind. On the 20th, headache and quick pulse, temperature 100°, very free perspiration. On the 21st temperature to 101.2° in evening, but then the patient seemed to improve, though subject to headache and heavy sweating. Temperature and pulse not much above normal. I suggested to Mr. Wells the propriety of performing ovariotomy, but he thought it would be best to keep her quiet in bed and watch her. Oct. 26th, after turning rather quickly in bed the patient complained of extreme pain in the abdomen; pulse rapid and feeble, temperature falling; face dusky. Kept quiet with tincture opii, and poultices over the abdomen. On the next day temperature 98°; pulse 140°; face dusky; cold perspiration and suppression of urine.

Operation.. The operation had the expected fatal outcome, but the comment of Thornton is noteworthy: "The case raises an interesting point as to the propriety of tapping or performing ovariotomy during pregnancy, as it is plain a similar accident might readily happen again. The facts that the child was certainly alive a few hours before the operation, and that through the whole case, ending in a severe operation and death, no sign of abortion occurred, seem to me strongly to support the advisability of performing ovariotomy at once, if any operation is necessary, a course also encouraged by Mr. Wells' successful cases."

There are reports of two cases operated on in 1878; one by Spiegelberg (2), the mother recovering, the pregnancy terminating in abortion three days after operation; the other by Schroeder (3) May 25, 1878, successful for the mother and child.

In the next year two cases underwent operation successfully at the hands of Wilson (4) and Lawson Tait (5). In the latter case a parovarian cyst was removed, the first of this kind noted. Since that time more than one hundred cases have been reported, by almost as many operators.

AGE OF PATIENT. 81 CASES

In 81 cases the age of the patient was noted, the youngest 19 (109), the oldest 43 (147). Dividing the child bearing period from 20 to 45 into five pentads, the table below gives the number of cases and the percentages.

Pfannenstiel says the most frequent new growths of the ovary, the cystadenomata are observed chiefly in the third to the fifth decade,

with a maximum between the twenty-fifth and thirty-fifth years. The maximum for dermoids is about the thirtieth year. This decade (twenty-five to thirty-five) represents also the height of the child bearing period.

AGE OF PATIENTS

Age of patient	Under 20	20–24	25–29	30–34	35–39	40–44
No. of cases	1	16	25	21	14	4
Percentage	1.23	19.75	30.89	25.92	17.28	4.93

PREVIOUS PREGNANCIES. 76 CASES

Direct relationship between ovarian tumors and pregnancy has not been shown, but certain general facts are fairly well established. Though ovarian growths may first give symptoms at almost any age, the percentage of married to unmarried women having ovarian tumors is about ten to six (Olshausen). The percentage of married to unmarried women at the time ovarian tumors chiefly appear is about seven to one (A. Martin).

The relaxation of the abdominal wall as affected by previous pregnancies may be considered as a factor in determining mobility, and therefore a tendency to twisting of the pedicle. The relatively greater number of families of not over four childen, than of families of more than four, probably fully explains the larger percentage in the smaller families in the table.

PREVIOUS PREGNANCIES

No. of preg.	0	1	2	3	4	5	6	7	8	13	Multi.
No. of cases	10	16	16	10	8	5	4	2	2	1	2
Pct.	13.15	21.05	21.05	13.15	10.52	6.57	5.27	2.63	2.63	1.31	2.63

MONTH OF PREGNANCY. 96 CASES

The third and fourth months are the most dangerous, as about 58 per cent of the cases noted occur at this time. Probably this is due to the increasing mobility of the tumor as the fundus reaches and lies near the brim of the pelvis. As the enlarging uterus encroaches on the abdominal cavity, diminishing the space for the other organs, and tending to fix the tumor, the danger rapidly decreases to the last months, when this complication is comparatively rare.

MONTH OF PREGNANCY

Mo. of preg.	1	2	3	4	5	6	7	8	9	10
No. of cases	9	29	27	12	8	6	3	1	1	
Percentage	9.67	30.20	28.12	12.90	8.63	6.45	3.22	1.07	1.07	

Anamnesis. In thirty-five cases there are notes of some suggestion of pelvic trouble before the present illness. In ten of these pain was noted, in three not severe; in seven severe and similar to present attack. In sixteen others a definite tumor was known to exist, and in nine there had been an unusual enlargement of the abdomen with no especial pain, and no definite tumor. In one case (28), an abdominal tumor had been discovered six years before, as an obstruction in the second pregnancy. Operation had not been necessary. This tumor doubtless persisted, but had not disturbed in any way four following pregnancies.

The history with considerable uniformity is of sudden and severe pain, not infrequently fainting, weakness, or collapse; some increase in the pulse rate, but little rise of temperature. In a few cases the temperature was at first subnormal. A study of the symptoms as recorded reveals little to be added to the now well known clinical picture. The condition with which it was most frequently confused is ruptured ectopic pregnancy; occasionally inflammatory adnexal disease, or appendicitis.

Side of origin, 70 cases. In 35 cases the tumor arose from the right side, in the same number, from the left.

Tumor. In the 114 cases there is no definite note of a solid new growth, but several are described simply as "ovarian tumor" and the character not stated. In one multilocular cyst the microscopical diagnosis was "endothelioma," the only suggestion of malignant character of any of the tumors. A more careful microscopical examination might have showed a larger proportion of malignant growths, but in many of the cases the strangulation made further examination of little value. But the concomitant pregnancy suggests another possible explanation of this relatively low percentage of malignancy. Malignant tumors of the ovary occur at a later period in life (maximum from the 45th to the 55th years), than do the non-malignant tumors. Also the fact that so frequently the malignant tumors are bilateral may militate against the simultaneous development of pregnancy. The percentage of malignant new growths in pregnancy, or the puerperium, is stated from 1.4

to 6.6 per cent (119). In this series twenty-three dermoid cysts were noted, a percentage of 20.35. In general the percentage of dermoids to all other ovarian tumors is 10. It has already been pointed out that dermoids seem somewhat more subject to twisting of the pedicle than do the other forms of ovarian new growth. In 2 cases there was found a dermoid of the other ovary, also a percentage of about 10, which agrees with the estimate in Pfannenstiel (119). There were 9 parovarian or broad ligament cysts, a percentage of 7.89. The origin and development of these cysts would lead us to expect a relatively small number of twisted pedicles, as many have no pedicle at all. But this figure (7.89 per cent), is not far from the percentages of occurrences quoted by Pfannenstiel; Lippert, 6.7; Schauta, 9.1; Olshausen, 11.3; Fritsch, 11.8; Martin, 14.4.

If the cyst is large, twisting of the pedicle is less likely to occur — the largest noted contained twenty liters (12); the smallest was the "size of a mandarin" (53).

Condition of the other ovary. In 22 cases the condition of the other ovary was noted — 15 normal, 4 dermoids, 1 cystic degeneration, 1 cyst, 1 multilocular cyst removed at previous operation. In cases of normal ovary the removed ovary was a "cyst" in 11; a dermoid in 4.

Number of twists of the pedicle. 68 cases. Many ovarian tumors show a twist of the pedicle of 90°, but the term is generally restricted to those in which symptoms arise from interference with circulation, rare under 180°. The greatest number of turns was three and one-half. There has been reported a case not complicating pregnancy, in which the pedicle sixty centimeters long was twisted 25 times (119).

NUMBER OF TWISTS. 68 CASES

No. of twists ...	½	¾	1	1½	2	2½	3	3½	Slight
No. of cases ...	5	1	15	14	18	4	9	2	1
Percentage. ...	7.35	1.47	22.05	20.58	26.47	5.88	13.23	2.94	1.47

Direction of twist. 22 cases. Küstner called attention to the fact that right sided ovarian tumors have a left spiral, left sided, a right spiral twist. The determination of the kind of spiral in any given case is as follows: the direction (side of the operator), toward which the tumor must be turned to untwist the pedicle gives the direction of the spiral. This law has been confirmed by most investigators. Lippert found 80.95 per cent of pedicles twisted typically; Bürger, 78 per cent; Wedekind, 85.7 per cent; but Frangenheim only 58½ per cent. In this series 40.90 per cent were typical, 59.10 per cent atypical. The number of cases is, however, rather small.

Several explanations have been offered.

1. "Bilaterally symmetrical organisms possess on the right side of the body a left spiral direction of growth." (Fischer.)

2. The direction is due to gross anatomical conditions — as the shape of the cavity bounded by the pelvis and abdominal walls, which are more or less fixed. The tendency from these fixed conditions, this shape of the cavity, is always an outward twist and varies thus according to whether the tumor receives its impulse while on the side of the pelvis from which it grows or after slipping to the other side. (Thorn.) The direction once being given, numerous factors of varying importance may accelerate or retard the motion — as changes in bladder, intestines, fœtal movements, movements of the whole body in changes of position.

DIRECTION OF TWIST

Dir. of twist	Right to Left		Left to Right		Total	Per cent.
No. of cases	4 rt. sided.	1 lft. sided	8 rt. sided.	9 lft. sided		
Typical	1		8	9		40.90
Atypical	4		9		13	59.10

Strangulation. Twisting of the pedicle may cause incomplete or complete stoppage of the circulation. In the latter case the arteries as well as the veins become occluded by pressure. If the stoppage is partial there may be only congestion, or from more marked obstruction to the venous flow, hæmorrhages. In many cases it has not been possible to determine, from the reports, with any degree of accuracy, which condition was present. Of 62 cases noted, half seemed to have merely hæmorrhages into the cyst; in the other half the occlusion was apparently complete, giving "gangrene" or "necrosis" or "purple" or "blackish" tumor. Frangenheim reports that out of 80 cases with twisted pedicle, 54 showed at operation no recognizable result of twisting of the pedicle. In this connection he notes that

Freund has called attention to the possibility of a spontaneous untwisting of the pedicle.

Results. Maternal deaths. In 106 cases in which the result is recorded there were six maternal deaths as follows:

(1) Death 16 hours after operation, which was performed on the day after symptoms of strangulation appeared. The tumor was gangrenous, and there was peritonitis, orginating probably at the time of tapping the cyst several days before ovariotomy.

(15) Death on the 16th day after operation. The date of operation (after the onset of acute symptoms) is not stated. There was hæmorrhage into the cyst. The cause of death was apparently sepsis.

(16) Death on the 3d day after operation. The date of operation not stated. Tumor gangrenous. Cause of death not stated.

(34) Death on the 2d day after operation, the date of which was the 4th day after the onset of acute symptoms. "Tense blood tumor." Cause of death not stated.

(61) Death on the 9th day after operation, the date of which is not stated. "Hæmorrhage into a dermoid." Cause of death "cardiac weakness."

(70) Death on the 8th day after operation, which was several days after onset of acute symptoms. "The tumor showed fresh hæmorrhagic areas." Cause of death "pleurisy and pneumonia."

This gives a mortality percentage of 5.62.

The percentages given by others (for ovariotomy in pregnancy including some cases of twisting of the pedicle) are:

	Per cent
Flatau, 284 cases, 7 deaths	2.46
Orgler	2.7
Dsirne	4.5
Patton	8.0
Aronson	16.9

Frangenheim reported 87 cases of ovariotomy for twisting of the pedicle with three deaths — 3.5 per cent.

Results. Interruption of pregnancy. In 105 cases in which the course of pregnancy was noted there were 25 interruptions. Of these four could not be traced to the operation.

(56) Abortion 10 weeks after operation.

(60) Abortion 2½ months after operation.

(64) Premature birth 6 months after operation.

(71) Abortion 3 weeks after operation and two days after going home.

In the 21 cases due to operation, the tumor was strangulated in fourteen; in seven, not strangulated or not noted.

In the early months the danger of disturbance is less (3d month 7.14 per cent). There is a marked increase in the 4th month to 19.23 per cent, after which the percentage is continuously high. In the single case in the 10th month (99) labor came on in 32 hours, and the patient gave birth to a normal child which lived. The percentage of interruptions is 20. The percentage mortality is reckoned after deducting (99) but including (58) and (101) in which the premature child lived but a few hours. This gives 20 cases of a total of 105, percentage 19.04.

The fœtal mortality after ovariotomy in pregnancy (including tumors with twisted pedicle) is variously stated.

Retzlaff, 11 per cent; Graefe, 16 per cent; Patton, 19 per cent; Bumm, about 20 per cent; Fehling, 23 per cent; Flatau, 25 per cent; Dsirne, 27.17 per cent; Waehmer, 27.8 per cent.

In only one case of abortion was it noted that the patient had previously had an interruption of pregnancy. This was (60) abortion 2½ months after operation, macerated fœtus.

INTERRUPTIONS TO PREGNANCY. 21 CASES

Mo. of preg.	1	2	3	4	5	6	7	8	9	10	Not stated
No. of interrupt...	1	2	5	4	2	2	1	..	1	2	
Cases noted in month	..	9	28	26	12	7	6	3	1	1	.
Percentage	..	11.11	7.14	19.23	33.33	28.50	33.33	33.33	..	100	..

With this may be compared Dsirne's table (ovariotomy in pregnancy up to 1892),

Mo. of preg	1	2	3	4	5	6	7	8	9	10
No. of interrupt.	..	5	4	2	4	4	3	2	1	..
Cases noted in month.	..	11	28	21	10	11	5	5	1	..
Percentage.	..	45.45	14.28	9.52	40	36.36	60	40	100	..

and the table compiled from the series reported by Flatau.

Mo. of preg.	1	2	3	4	5	6	7	8	9	..
No. of interrupt.	0	4	8	8	10	3	3	0	0	..
Cases noted in month.	1	32	43	44	30	19	13	5	2	..
Percentage.	..	12.50	18.60	18.36	33.33	15.78	23.07	..	..	..

From various sources the following figures have been compiled. Percentage of pregnancies in which ovarian tumor occurs:

Weiss (V. Braun)	.015
Fehling	.11
Löhlein	.15
Pfannenstiel	.57
Martin	1.5

Percentage of ovarian tumors complicating pregnancy:

Segalowitz	3.
Wedekind	3.4
Lippert	3.45

Percentage of ovarian tumors having twisted pedicle:

Spencer Wells	2.4
Orgler	4.
Olshausen	5.5
Williams	6.
Dsirne	6.
Frangenheim	8.2
Flatau	10.
Waehmer	11.5
Aronson	12.5
Pfannenstiel, average of	20.
Horwitz	23.
Thorn	35.
Küstner	38.8

The time for the discussion of the advisability of operation in these cases has long gone by. A comparison of the maternal mortality in the present series, of less than six per cent, with the mortality of 80 per cent if no operation is performed (Aronson) should remove any doubt which may remain. The question of the time of operation, whether immediate or a few hours later under more favorable conditions, is one which has to be decided by the individual surgeon who sees the case. "More favorable conditions" must include the condition of the patient as well as better mechanical facilities for operating.

Apart from the conclusions which have already been noted, a consideration of the tables of interrupted pregnancies suggests that the time of election for the removal of an ovarian tumor discovered during pregnancy is the early months. It should be removed, in general, as soon after discovery as possible. The conditions are most favorable for the tumor, the fœtus, and the mother. As pregnancy advances after the fourth month the danger of twisting of the pedicle decreases but other complications may arise; particularly in the puerperium is some complication probable, should labor be undisturbed, and at that time the patient is in a less favorable condition for an abdominal operation.

I desire to express my thanks to Dr. H. A. Kelly of Baltimore, to whose clinic the patient was admitted, and through whose courtesy I was enabled to operate. For the pathological report I am indebted to Dr. D. B. Casler of the Johns Hopkins Hospital.

In reviewing the literature, the references to cases in which the original article is stated in the table, it has been possible to confirm. In addition to the references in the table, the following articles have been consulted:

115. Aronson. Inaug. Diss. Zurich, 1883.
116. Dsirne. Arch. f. Gyn., 1892. Bd. xlii, hft. 3.
117. Orgler. Arch. f. Gyn. Bd. lxv, p. 126–160.
118. Patton. Surg. Gyn. Obst., September, 1906.
119. Pfannenstiel-Veit's Handbuch der Gynækologie. Bd. iv, abt. 1
120. Remy. These, Paris, 1886.
121. Williams, J. Lancet, 1897, vol. ii, p. 129.

REPORTS OF CASES

1. THORNTON. Trans. Path. Soc., Lond., 1876, p. 212. Age 28. 1 previous preg. 4½ mos. Cyst tapped several days before. Sudden pain with collapse on turning in bed. Operation on following day. Right multilocular cyst. 3½ turns. Gangrenous M. D. 16 h. p. o.
2. SPIEGELBERG. Berl. Klin. Wch., 1879. Nr. 18, S. 253. Age 23. 3 mos. Left. Cyst. 1 turn. Fresh hæmorrhage into cyst. M. R. Abortion, 3 d. p. o.
3. SCHROEDER. Ztschr. f. Geb. u. Gyn., 1880. Bd. v. 383. Age 24. 1 p. 3 mos. Abdomen increasing very rapidly. Cyst. 1 turn. M. R. Term.
4. WILSON. Trans. Amer. Gyn. Soc., 1880, vol. v, p. 100. Age 40. viii p. Twins once; o abort. Tumor in rt. groin w. last child 5 yr. a. Severe pain 8 m. a. Op. 15 d. after onset of ac. symps. Right. Multilocular; some adhesions. "Acute symptoms," three gals. of bloody fluid. M. R. Term.
5. TAIT. The Med. Times & Gaz., 1880, vol. i, 357. Age 36. Multip. 4 mos. Sudden severe pain and "sickness." Right parovarian. 3 turns "from within outward and to the right." Pearly black tumor. M. R. Preg. not disturbed.
6. CHIARA. Ann. di Ostet. (Milano) 1885, vii, 453. Age 34. i p. 7 mos. Tumor on right side with some symptoms of peritonitis for several weeks. Puncture of tumor and uterus. Operation 12 d. later for sudden and urgent symps. Right. Cyst. (uterus punct. again at op.). 3 turns. "Sudden urgent symptoms," "dark fluid." M. R. Abortion 1 d. p. o.
7. SKENE KEITH. Edin. Med. Jour., 1886. Mar. p. 837. Age 38. viii p. Indic. for op. Slightly increasing lump for 1½yr. Cyst. "Slight" twist of pedicle. "Inside of tumor gangrenous." M. R. Term. Pt. delivered of child some months after operation, but pregnancy not recognized at operation.

8. HEILBRUNN. Münch. Med. Woch., 1887, S. 278. Age 30. v p. Last 2 y. before. 4 mos. In past 10 mos. gradually increasing tumor in abdomen with pain, fever, malaise. Op. for pain and possible obstruction to labor later. Right side. Dermoid and multilocular cyst. 2 turns. "Whole tumor hæmorrhagic." M. R. Term.
9. REUTER. (Op. Küstner.) Inaug. Diss. Jena, 1886. Age 25. 3 mos. Pain in abdomen. Right. Cyst. 180°. "Surface of cyst necrotic." M. R. Term.
10. TERILLON ET VALAT. Arch. d. Tocolog., 1888, xv, 207. Age 30. ii p. Latter 5½ y. a. 2 mos. Tumor in past 5 yrs.; 2 attacks of pain, fever, and vomiting in past 3 yrs. Right. Cyst. Small cyst of other ovary. 3 turns from L. to R. M. R. Abortion 10 d. p. o.
11. MAYO-ROBSON. Brit. Med. Jour., 1889, p. 1034. Age 25. o p. o abortion. Sudden colicky pain in abdomen. Op. 10th day. Left multilocular cyst. L. to R. "Sloughing." M. R. Preg. not disturbed.
12. STIEGLITZ. Inaug. Diss. Erlangen, 1889. Age 29. i p. 3 mos. Increase in size of abdomen in past 9 yrs., esp. in last few. In 1st preg. enormous abdominal distention from which pt. suffered. Also peritonitis 4 mos. before and crural thrombosis. Since then tumor rather smaller. Left. Cystoma, 20 liters of fluid, blood stained. M. R. Term.
13. HINTZE. (Op. Ahlfeld.) Inaug. Diss. Marburg, 1891. Age 24. 1 p. 3 mos. Left. Parovarian. M. R. Term.
14. IBID. Age 32. iv p. Last 11 mos. before. 3 mos. Right. Cyst. M. R. Term.
15. IBID. Aet. 37. iv p. Last 9 mos. before. Right. Cyst (adherent to intestine and omentum). Hæmorrhage into cyst. M. D. 16d., p. o. Abortion 3d. p. o. Pt. apparently died of sepsis.
16. BAUDRON. (Op. Pozzi.) Soc. Anat., 1891, Mar., p. 270. Aet. 28. ii p. Latter 3 y. before. 4 mos. Occasional sharp pain in left ovarian region in past 3 yrs. Severe pain in left iliac fossa. Eleven days later op. for urgent symptoms. Left. Cyst. 3 turns. L. to R. Gangrenous tumor. M. D. 3d., p. o. Abortion 2d., p. o. Macerated fœtus.
17. RIEDINGER. Prag. Med. Woch., 1891, S. 197. Aet. 27. iii p. Last 2½ y. before. 5 mos. Severe pain in abdomen with vomiting and swelling of abdomen. Left. Unilocular cyst. 1½ turns. L. to R. "Gangrenous looking." M. R. Term. Pregnancy ended almost at term, — living child.
18. IBID. Aet. 38. ii p. Latter 2½ y. before. Op. 14th day, 2d attack. Left. Multilocular cyst. 2 turns. "Brownish red" tumor. M. R. Preg. not disturbed.
19. VON BANDISCH. (Op. Dohrn.) Diss. Königsberg 1892. Aet. 27. iii p. 6 mos. Pain in left side of abdomen after lifting heavy weight 3d. before. Then a tumor was noticed. Op. in 1st week for acute symps. Left. Dermoid. 1 turn. "Blue black tumor." M. R. Preg. not disturbed.
20. WEISS. (Op. V. Braun.) Beitr. Z. Chir., 1892, 235. Aet. 24, o. p. 5 mos. For 4 mos. gradually increasing tumor in lower abdomen. In past week rapid increase in size with severe pain. Left. Cyst. 1½ turns. L. to R. Hæmorrhage into tumor. M. R. Spontaneous birth of living child on going home five weeks later.
21. IBID. Age 30. o p. 7 mos. Pain for several months, severe in past 2 wks. Right. Dermoid. 360°. R. to L. Strangulated. M. R. Preg. not disturbed.
22. KREUTZMANN. Amer. Jour. Obst., 1892, p. 204. Age 28. ii p. Latter 1½ y. a. 2 mos. Op. 1 wk. after first seen. Left multilocular cyst. ½ turn from "outside to inside." "Fresh blood." M. R. Preg. not disturbed.
23. OLSHAUSEN. (From Dsirne.) Age 25. 8 mos. Cyst. M. R. Term.
24. FROMMEL. (From Dsirne.) 3 mos. Cyst. M. R. Term.
25. TERILLON. (From Dsirne.) 3 mos. Cyst. 1½ turns. M. R. Term.
26. SCHROEDER. (From Dsirne.) Age 25. 8 mos. Proliferating ovarian cyst. Adherent omentum. M. R. Term.
27. MEREDITH. Trans. Obst. Soc., Lond., 1892–3, vol. xxxiv, p. 239. Age 31. vi p. Last 1 yr., 10 mos. bef. Some abdominal swelling 12 mos. before. Operation for severe pain on 6th day after acute symps. Left multilocular. Dermoid of other ovary. M. R. Term.
28. TRAVERS. Lancet, 1894, p. 146. Age 29. vi p. Last 11 mos. before. 4 mos. 6 y. before abd. tumor which obstructed 2d confinement. Operation not necessary. No obstruction in subsequent confinements. Op. 10th d. Right. Cyst. 2 turns. L. to R. "Beginning gangrene." M. R. Preg. not disturbed. 4 mos. after operation pregnancy progressing all right.
29. MERKEL. Münch. Med. Woch., 1895. Nr. 37. Age 39. vi p. 4 mos. Gradually increasing melancholia. Marked distention of abdomen. Right. Cyst. Other ovary, cystic degeneration, ½ removed. 1½ turns. "Purple." M. R. Term.
30. SCHWAN. Inaug. Diss. Heidelberg, 1895. Age 24. ii p. o abort. 4 mos. Operation, 6 wks. from onset of pain. Parovarian cyst. 1½ turns. M. R. Term.
31. HIRST. Amer. Jour. Obst., 1895, vol. xxxii, p. 224. 1 p. 1 abortion. 3 mos. Occasional pain in left groin for 1 yr. (since miscarriage). Worse in past 2 wks.; 1 wk. ago very severe and occasionally since. Left dermoid. 1 turn. M. R. Preg. not disturbed.
32. BECKING. (Frommel Jahr. Geb. u. Gyn., 1896.) 7 mos. Ovarian cyst. M. R. Term.
33. MORSE. Trans. Obst. Soc., Lond., 1896. Age 30. Multip. Last 2 y. before. 9 mos. No acute symptoms. Right. Dermoid. 1 turn. L. to R. "Gangrenous." M. R. Term. Forceps at term to take strain from recent abdominal scar.
34. LÖHLEIN. Deut. Med. Woch., 1896. Nr. 29, S. 455. Age 33. ii p. o abortions. 6 mos. Severe pain in left side of abdomen, vomiting, obstipation, distention. Op. 4th day. Left. Multilocular. Corpus luteum in cyst wall. 2 turns L. to R. "Tense blood tumor." M. D. 2 d. p. o.
35. NAUMANN. Hygeia. Bd. xviii, Nr. 9, p. 1967. Age 38. vii p. 4 mos. Similar attack of pain some time before. Op. 6th day of acute symps. Right. Cyst. 1½ turns. "Blood stained fluid." M. R. Abort. 7 d. p. o. Much macerated fœtus.
36. JONES. Med. Rec., N. Y., 1897, i, p. 418. Age 29. 4 mos. Op. 4th day of acute symps. Left. Cyst. "Black." M. R. Abortion 24 d. p. o. On 23 d. p. o., chill, fever to 104° for over 24 hrs, when the abortion occurred. Incision had been suppurating since op.

37. NEUGEBAUER. (Frommel Jahresb. der Geb. u. Gyn.) 1897. 3 mos. Ovarian cyst. Peritonitis. M. R. Abortion day of operation.
38. BOUILLY. (Op. Chaput.) La Gyn., 1898, iii, 481. Age 28. iii p. Last 2 y. before. 0 abortion. 3 mos. 5 y. bef., puncture of cyst of right side with apparent cure. Severe pain and vomiting for 4 days before operation. Right. Parovarian. 3–4 turns. "Apoplectic" tumor. M. R. Preg. not disturbed.
39. BARON. These, Paris, 1898. Age 23. i p. Tumor since birth of 1st child. Severe pain and vomiting. Op. on 6th day of acute symps. Right. Ovarian cyst. 1½ turns. R. to L. "Blackish." M. R. Term.
40. PRIOR. (Frommel Jahr. der Geb. u. Gyn. 1898.) 5 mos. Acute symps. Parovarian cyst. M. R. Term.
41. WAGENER. Diss. Amsterdam, 1899. 6 mos. Three mos. before, pain in right groin. Lump in right side which has increased considerably in size in past 2 days. Right. Dermoid. Other ovary normal. 1½ turns. "Bluish red" tumor. M. R. Preg. not disturbed.
42. IBID. Age 28. i p. 2 mos. Sudden severe pain. Op. 4th day. Left. Multilocular cyst. ½ turns. Bloody fluid in cyst. M. R. Term.
43. IBID. (Case of Zweifel.) Age 40. iii p. 1 abortion. Tumor discovered before beginning of pregnancy. Sudden onset of pain. Cyst. M. R. Term.
44. TULL. Amer. Gyn. Obst. Jour., 1899, vol. xv, No. 2, p. 137. 6 mos. Cyst. 2 turns. M. R. Term.
45. IBID. (In discussion "Coe reports similar case.") Pregnancy. Cyst. Twisted pedicle.
46. PÜRCKHAUER. Diss. Würzburg, 1900. Age 24. i p. 6 mos. Marked abdominal distention and pain. Of late some fever. Right. Other ovary normal. 1½ turns. Strangulated. M. R. Term.
47. IBID. Age 43. xiii p. Last 3 y. bef. 2 mos. Pain and abdominal distention worse of late. Right. Very adherent cystoma. Other ovary normal. 2½ turns. Bloody fluid in tumor. M. R. Preg. Term.
48. IBID. Age 32. iii p. 5 mos. Increase in size of abdomen with pain for several months. Left. Cystoma. 1 turn. Not strangulated. M. R. Preg. not disturbed.
49. IBID. Age 32. vi p. (1 premature in 7 mos.) 4 mos. Slowly increasing tumor since last pregnancy. Right. Cystoma. Other ovary normal. 1 turn. M. R. Preg. not disturbed.
50. LUND. Bost. Med. & Surg. Jour., 1900, p. 208. Age 27. ii p. Latter 10 mos. before. 4 mos. Sudden severe pain and vomiting. Right. Parovarian cyst. 3 turns. Hæmorrhage into wall of cyst. M. R. Preg. not disturbed.
51. WAEHMER. (Op. Kaltenbach.) Inaug. Diss. Halle, 1900. Age 25. iii p. 2 with forceps. For three months pain in lower abdomen, nausea, and vomiting. Dermoid. M. R. Term.
52. PINARD ET SEGOND. Comp. Rend. d. la Soc. d'Obst., Gyn. et Pæd. de Paris, Tom. ii, p. 75, 1900. Age 26. ii p. Latter 2 y. before. 3 mos. Sudden onset symps. of peritonitis. Cyst adherent. 2 turns. Strangulated. M. R. Preg. not disturbed.
53. IBID. (In discussion Segond notes following case.) Age 20. i p. Gradually increasing symps. of "pregnancy and adnexal disease." Right. Cyst (size of mandarin). 1 turn. M. R. Abortion 8 d. p. 0.
54. PIERSIG. Inaug. Diss. München, 1901. Age 32. vii p. 5 mos. Attack of peritonitis 14 mos. before. Severe pain in abdomen 3 wks. before. Right. Multilocular cyst. 2 turns L. to R. Hæmorrhagic fluid from cyst. M. R. Preg. not disturbed.
55. IBID. Age 39. iv p. 3 abortions. 3 mos. Lump in abdomen, not tender. Left. Multilocular cyst. Other ovary normal. ½ turn. M. R. Preg. not disturbed.
56. IBID. Age 21. 0 p. 0 abortion. 4 mos. Op. 10–12 day of disease. Left. Unilocular cyst. Normal. 2 turns. Hæmorrhagic infiltration of tumor. M. R. Abortion 10 wks. p. o. due to severe work of pt.
57. IBID. Age 22. i p. 4 mos. Sudden appearance of tumor with severe pain 1 y. before. Repeated 11 d. before. Left. Multilocular cyst. 2½ turns. Hæmorrhage into cyst. M. R. Preg. not disturbed.
58. IBID. Age 39. v p. 8 mos. Pain in left side of abdomen 2 mos. Left. Multilocular cyst; many adhesions. 2 turns. No sign of strangulation. M. R. Premature birth 1 d. p. o. Child lived several hours.
59. FLATAU. Münch. Med. Woch., 1901, p. 1902. 3½ mos. Sudden appearance of symptoms of peritonitis. Dermoid. 3½ turns. Strangulation. M. R. Preg. not disturbed.
60. HELLIER. Lancet, 1901, p. 1727, Dec. 21. Age 42. iii p. 2 abort.; the latter 20 mos. before. Op. for freely movable tumor. Right. Dermoid. M. R. Abortion 2½ mos. p. o. Macerated fœtus. Mother thought fœtus died soon after operation.
61. BLAND-SUTTON. (Op. Berry Hart.) Lancet, 1901, p. 384, Feb. 9. 5 mos. Left. Dermoid. Hæmorrhage. M. D. 9 d. p. o. "Cardiac weakness."
62. LITTLEWOOD. Brit. Med. Jour., 1901, No. 9, p. 1410. 7 mos. "Ovarian tumor."
63. LÖWENBERG. Zent. f. Gyn., 1901, p. 1389. Age 27. i p. 3–4 mos. Op. 3 days after onset of acute symps. Right. Multilocular cyst with dermoid. M. R. Preg. not disturbed.
64. KREUTZMANN. Am. Jour. Obst. 1901, p. 160. 0 p. 2 mos. Op. 15th day after onset of acute symps. Left. Multilocular cyst. Other ovary normal. "Several" turns. Hæmorrhage into the cyst. M. R. Premature birth 6 mos. later.
65. IBID. 4 mos. Ovarian tumor with pregnancy. Multilocular cyst. Normal other ovary. "Several" turns. Strangulated. M. R. Abortion 4 d. p. o.
66. KROMBACH. Inaug. Diss. Giessen, 1902. Age 34. v p. 1 abortion. 2 mos. Op. 14th day of acute symps. Left. Cyst adherent to intestine and omentum. Normal other ovary. 2½ turns. Hæmorrhage into tumor. M. R. Pregnancy not disturbed.
67. IBID. Age 32. ii p. Both operative deliveries. 4 mos. For 15 mos. "Tumor of rt. ovary." Pain. Right. "Cyst size of fist." Other ovary normal. 3 turns. M. R. Preg. not disturbed.
68. IBID. Age 35. iv p. 6 abortions. 3 mos. Pain in right side for several weeks. Right. Cystoma. Other ovary normal. 2 turns. Preg. not disturbed.
69. IBID. Age 23. 0 p. 0 abortions. 3 mos. Rt. ovary removed some time before, a multilocular cyst. Left, multilocular cyst. Endothelioma. Other ovary removed at previous operation. ½ turn. Blood in cyst. M. R. Pregnancy not disturbed.

70. IBID. Age 28. Pain in right side for several days. Left. Dermoid. 1 turn. L. to R. Fresh hæmorrhagic areas in cyst. M. D. 8 d. p. o. "Pleurisy and pneumonia." Abortion 3 d. p. o.

71. RAUSCH. Inaug. Diss. Leipzig, 1902. Age 28. ii p. 2–3 mos. Attack of severe pain in abdomen several months before. Unilocular cyst. 1 turn. Not strangulated. M. R. Abortion 3 wks. p. o. 3 d after going home.

72. WALTER. Jour. Obst. & Gyn. Brit. Emp., 1903, Jan., p. 93. Age 31. 4 mos. Cyst. 1 turn. "No change in cyst from rotation."

73. HARTMANN. Ann. de Gyn., 1903, p. 453. Age 23. Sudden severe pain 11 d. before. Cyst of broad ligament. 1 turn. "Slightly ecchymotic pedicle." M. R. Preg. not disturbed.

74. HAULTAIN. Jour. Obst. & Gyn. Brit. Emp., 1903, p. 399. 4 mos. Cyst.

75. BAR. Zent. f. Gyn., 1903, S. 670. 4 mos. Cyst. M. R. Preg. not disturbed.

76. MACÉ. Ibid. In discussion of Bar's case. "Macé reports similar case."

77. FRANGENHEIM. Inaug. Diss., Berlin, 1903. Age 30. iii p. 1 abortion. 3 mos. Increase in size of abdomen before pregnancy began. Left. Cyst. Dermoid of other ovary. M. R. Pregnancy not disturbed.

78. IBID. 4 mos. Cyst. M. R. Pregnancy not disturbed.

79. IBID. 6 mos. Cyst. M. R. Pregnancy not disturbed.

80. JESSURAN. Monats. für Geb. u. Gyn., 1903, Bd. xvii, S. 661. 4 mos. Symptoms of collapse. Dermoid. M. R. Preg. not disturbed.

81. LAPEYRE. Bull. et Mem. de Soc. de Chir. de Paris, 1904, N. S. 30, p. 771. Age 26. o p. o abortions. 2 mos. Increase in size of abdomen in past year. Attacks of pain. Left. Dermoid. Normal. 1½ turns. "Purple" tumor. M. R. Term.

82. IBID. Age 22. o p. o abortion. 3½ mos. Op. 9th day after onset of acute symptoms. Left. Dermoid. 2 turns. Bloody fluid in cyst. M. R. Abortion 1 d. p. o.

83. FRY. Wash. Med. Annals, 1904–5, iii, p. 448. o p. 3-4 mos. Severe pain for wks. Cyst. 2 turns. Gangrenous.

84. LEPAGE. Rev. Prat. d'Obst. et de Pæd., 1904, xvii, 253–261. Age 24. o p. 4 mos. Small tumor noticed by physician. Op. 3 days after onset of acute symptoms. Left. Dermoid. 3 turns. "Opposite hands of watch." "Strangulated." M. R. Preg. not disturbed.

85. KELLY. Glasgow Med. Jour., 1905, lxiv, 136. Age 27, ii p. 4 mos. One month before severe pain, and a tumor was found in pelvis. Relieved by pushing tumor out of pelvis. Similar attack 11 days before operation. Right. Dermoid. Other ovary normal. "Tumor almost black." M. R. Pregnancy not disturbed.

86. ZACHARIAS. Zent. f. Gyn., 1905, S. 468. Age 30. iv p. 2 mos. Right parovarian. 2 turns. M. R. Preg. not disturbed.

87. HEINSIUS. Ztsch. f. Geb. u. Gyn. Age 35. ii p. 5 mos. Severe symptoms of peritonitis. Operation "in a few days." Right. Dermoid, adherent. Other ovary a dermoid, 180° twist to its pedicle. 2 turns to original tumor. "Küstner's law." Blue-red color. M. R. Preg. not disturbed.

88. PORTER. Fort Wayne Med. Jour. Maga., 1905, xxv, 29. Age 24. ii p. Latter 18 mos. before. 3 mos. Abdomen large since last confinement. 6 days before op. severe pain in right side. Right cyst. 2 turns. R. to L. Blood in wall of cyst. Case reported too soon after operation to give result.

89. IBID.

90. IBID.

91. IBID. In J. A. M. A., 1905, xliv, p. 870. These four cases are again reported and the statement is made "none of the three miscarried."

92. GRAEFE. Ztsch. f. Geb. u. Gyn., 1905, Bd. 56, hft. iii, S. 499. 1 p. o abort. 7 mos. Sudden severe pain beginning one week before. Continuous pain with remissions. Cyst. 2 turns. "Clear fluid in cyst." M. R. Term.

93–97. GUICCARDI. From Graefe. See 92. Five cases of cyst in 3–4 mos. "Acute hæmorrhage with infiltration." M. R. Preg. not disturbed.

98. GERSTENBERG. Zts. f. Geb. u. Gyn. 1906, Bd. 57, hft. iii, S. 494. Age 29. i p. 3 mos. Increase in size of abdomen for 2 yrs. Left. Polycystoma. Other ovary normal. 270°. M. R. Term.

99. AGUILAR. Gac. Med. de Granada, 1906, xxiv, p. 187. Age 37. iv p. 10 mos. In 3d preg. suspected twins. Tumor discovered in puerperium. Patient under observation for a long time. Left. Multilocular cyst. 2½ turns. L. to R. Bloody fluid in cyst. M. R. Normal birth 32 h. p. o. Child weighed 3,369 gms.

100. BERGESIUS. Gior. di Ginec. ed Pediat., 1906, vi, 161. Age 22. i p. 5 mos. R. Multilocular cyst. 1½ turns. L. to R. Bloody fluid in abdomen. M. R. Abortion 1 d. p. o.

101. SIMON. Deut. Med. Woch., 1907, p. 1562. 7 mos. Op. 3d day. Ovarian cyst. M. R. Premature 3 d. p. o. Child died after 2 days.

102. FLATAU. Arch. f. Gyn., 1907, Bd. 82, S. 452. Age 34. v p. 4 mos. Severe pain in abdomen for six weeks. Dermoid. 1½ turns. M. R. Pregnancy not disturbed.

103. IBID. Age 38. 5 mos. Severe pain and symptoms of peritonitis for several days. Dermoid. "Hyperæmia and fresh hæmorrhage." M. R. Pregnancy not disturbed.

104. IBID. Age 27. i p. 5 mos. Pain in right side and swelling. Multilocular cyst. 2 turns. M. R. Abortion 9 d. p. o.

105. GRAEFE. (From Flatau.) 3 mos. Cyst. M. R. Preg. not disturbed.

106. SAPALLI. (From Flatau.) 6 mos. Cyst adherent to intestine and omentum. M. R. Abortion 1 d. p. o.

107. WATKINS. Surg. Gyn. Obst., 1907, v. 604. 5 mos. Symptoms of general peritonitis with large tumor. Right cyst. Strangulated. M. R. Preg. not disturbed.

108. NORDENTOFT. Jahresb. Geb. u. Gyn., 1907, S. 400. Age 33. iv p. Repeated attacks of severe abdominal pain. Right. Dermoid. 1½ turns. L. to R. M. R. Pregnancy not disturbed.

109. ROBB. Clev. Med. Jour., 1907, vi, p. 237. Age 19. ii p. Latter 11 mos before. Pain for about 1 mo. Severe in past two days. Left. Dermoid. Other ovary normal. 2 turns. R. to L. Strangulated. M. R.

110. RETZLAFF. (Op. Bauer.) Monat. f. Geb. u. Gyn., 1907, Bd. 25, p. 650. Age 35. iii p. Last 3 y. before. 1 abortion. 5 mos. After first pregnancy, swelling of rt. side; painful with each pregnancy. Sudden pain 10 d. before operation. Right. Parovarian. M. R. Term.

111. IBID. (Op. Martin.) Age 38. ii p. Latter 8 mos. before. About 3 wks. before op., severe pain and some bleeding. Right. Dermoid. Strangulated. M. R. Preg. not disturbed.

112. MARTIN. (In discussion of Retzlaff 110.) Age 32. iv p. 4 mos. Cyst. "Peritoneum reddened; flakes of fibrim." M. R. Preg. not disturbed.

113. AGNEL ET PAMARD. Bull. et Mem. de la Soc. de Med. de Vaucluse, 1907, iii, 597. Age 30. ii p. 4 mos. Movable lump in abdomen before pregnancy began. Op. 6th day of acute symptoms. Left. Cyst. 3–4 turns. M. R. Term.

114. AUTHOR. Age 32. v p. Last 11 mos. before. 0 abortions. 4 mos. Well up to one day before admission to hosp. Sharp cramplike pain in left side of abdomen low down. Op. 4th day. Left. Dermoid. 1½ turns. Strangulated. M. R. Term.

PITFALLS IN URINARY DIAGNOSIS[1]

A PLEA FOR SCIENTIFIC UROLOGY

BY BRANSFORD LEWIS, B. S., M. D., ST. LOUIS, MISSOURI

THE topic chosen for discussion just now is one that to me is of enthralling interest always; one that ever becks invitingly, and loses nothing by repetition and reiteration. Diagnosis is the one substantial rock on which we can base our reliance in the perennial combat against disease. Whatever the mutations of pathology or the changing fads of therapy that present themselves in kaleidoscopic review from year to year, diagnosis must ever stand firm and enduring, changing only as it becomes more broad and unassailable. It must be tangible, accurate, definite, comprehensive, complete. Shortcomings in respect to diagnosis render void and worthless the most beautiful structures of theory and practice that can be erected. Such shortcomings allow human beings to suffer for months and years that might, with diagnosis made clear, be healthy and useful citizens all of that time. They would be within easy reach of relief all of that time if only the cause of the complaint were recognized. I recently removed a stone as big as a hen's egg from the bladder of a man who, as indicated by his history, had carried it for ten years. For the past two years he had been urinating during the day time every twenty minutes, and during the night, every thirty minutes. He had practically given up his business in order to attend to the more urgent demands of frequent urination; and sleep had become a lost art with him. Will anyone say that the difficulty in this case, the thing that retarded his attainment of relief, was that of *removing* the stone? Will anyone say that there could be any justification for failure to discover, with even the most elementary examination, a stone as large as that? And yet the patient had expended a very considerable portion of his possessions in his prolonged quest for relief; had consulted all of the several physicians of his community, receiving only *medicinal treatments* and urinary soothing syrups in the shape of santal-this and anti-that, but *never a semblance of physical examination or a definite attempt at diagnosis.*

This illustrates a most unfortunate habit to which some of our noble profession are addicted: That of skipping diagnosis altogether and jumping pell-mell into some kind of alleged treatment for urinary symptoms; treatment that often cannot possibly do any good, but if effective at all, accomplishes the greatest harm by palliating and masking the evidences being offered by nature as signals of distress, and that are the most valuable means possible for directing attention to the afflicted organ. Heartrending are the results of such practice. Many are the monuments commemorative of its exalted ignominy — seen most frequently on the post-mortem table, as atonied bladders, dilated ureters, distended renal pelves and sacculated, destroyed kidneys — so-called "surgical kidneys," that, really, are anything but surgical kidneys; that would never have become thus

[1] Annual address delivered by invitation before the Urologic Section of the Ohio State Medical Association, Cincinnati, May 6, 1909.

destroyed if surgery had not been withheld from them, usually through total disregard of diagnosis.

One would think, from the stately, dignified, and methodical manner in which diagnosis receives its review in conventional contributions on the various diseases affecting humanity, that it would receive due consideration in the practical phases of every physician's life — at the bedside and in the clinic. But experience forces the conclusion that this, unfortunately, is not always true, at least in the domain of urinary affections.

Perhaps one reason for this is that the urinary organs are more difficult of access than others of the body; their investigation is thus rendered less easy, their exposure cannot be made quite so evident. But do obstacles justify lax endeavor in medical work? The consolation of such a doctrine is not given to us. And, besides, the means for investigating precisely and comprehensively the whole urinary tract from end to end are so multifarious, so exact and reliable that the slightest thought disposes of such a claim.

Gentlemen, there is no longer excuse or warrant for the lapses in urinary diagnosis that were formerly accepted or condoned as necessarily incidental to medical practice, unless the various means for attaining exactitude in diagnosis have been exhausted. If one undertakes the responsibility of treating a patient he must at the same time assume the responsibility of acquiring for the patient the full quota of necessities for attaining complete diagnosis, on which the treatment must necessarily be based. Because he does not possess or does not know how to use a given instrument or means of diagnosis, does not excuse him from the responsibility of having such means used, when necessary, on the patient. How many of us personally use the X-ray apparatus? And yet how few of us could get along now-a-days without its magnificent orientation!

So much for the relative disesteem in which diagnosis currently and practically stands, as compared with treatment. As to the relative importance of the several features upon which a diagnosis must rest, the history, symptomatology, semeiology, and physical examination, I have elsewhere[1] had this to say: "The two steps necessary in arriving at a diagnosis of disease are: (1) acquiring the evidence referable to the affection; and (2) reaching correct deductions from that evidence. By some the chief part of this program is considered to be the eliciting of an elaborate and systematic history of the case, with the collection of all side-lights, observations, and impressions of the patient. The French have been especially diligent in developing the symptomatology of disease and bringing to bear an able scientific analysis. The modern trend, however, seems to be away from this direction, placing greater reliance on the numerous direct methods of examination that have come into vogue. With these at one's disposal, it is probable that the diagnostician can, in a few minutes of investigation, acquire more definite and material information than he can with hours of research into a case-history.

"There are reasons for this, aside from the materialistic bent of modern practice. The prominent symptoms of urinary affections, while strongly indicative of disease at certain points, are not efficient for differentiating between the several forms or kinds of disease that may affect those parts. It is a common thing for patients afflicted with urinary disease to relate their troubles to one another, with the unvarying conclusion that they are suffering from the same complaint, basing it on the common symptom, for instance, of frequent urination; whereas, the one may be affected with tuberculous cystitis, the second with stricture, and the third with renal disorder — totally different affections in their pathologic basis."

It is probable that the most capacious pitfall in urinary diagnosis is that presented by illusory symptomatology, misleading the investigator at times by simulations, at times by reflected nervous impressions, or by secondary involvements that become more prominent than the original affection; and also by reversed or transferred influences do the symptoms of urinary affections make themselves notoriously unreliable for diagnosis. The transference of pain from a diseased kidney to the healthy one of the opposite side,

[1] Keen's Surgery, vol. iv, "Surgery of the Bladder," page 272.

is now so generally recognized as frequent-occurring in renal derangements that alert diagnosticians are ever on the look out for it. The better of two kidneys has been removed in many instances for no less a reason than this. But, happily, this opprobrium hardly pertains to modern surgery, fortified as it is with better means and measures of efficiency than symptomatology.

To review them more in detail, we might consider the more important diagnostic pitfalls of the several parts of the tract as follows: *a*, of the urethra; *b*, prostate; *c*, seminal vesicles; *d*, bladder; *e*, ureters; *f*, kidneys.

Of the urethra. Urethritis. A diagnosis of urethritis only is inadequate for present day needs. Additional to that one must determine (1) whether the urethritis is gonorrhœal or simple; (2) whether it affects the posterior as well as the anterior urethra; (3) what complications or extensions of the disease exist. Anything short of this in urethral diagnosis may and frequently does lead to indefinite continuance or recurrence of the infection as well as extension to the upper urinary tract. Countless numbers of inveterate gonorrhœas have persisted only because of lack of recognition and treatment of the posterior urethra, which being infected, stays infected indefinitely until cleaned out and disinfected by *posterior treatment*, something impossible to furnish with the old-fashioned clap syringe and internal treatment.

The microscope for detecting the gonococcus; the double-glass urine test for determining the question of posterior involvement, and the prompt recognition of complications or extensions of the infection to allied organs that habitually lead to reciprocal reinfection — are the means available for avoiding this sequence of events.

Take nothing for granted in urinary diagnosis. So skeptical am I of accepting appearances at their face value, in urinary investigation, that I have long been in the habit of following a uniform plan of examining the whole genitourinary tract, no matter what was presumed or thought to be the location of an infection or inflammation.

The necessity of pursuing such a plan has many times been made evident to me. Cases in which perfectly clear urine had been passed into two glasses, apparently eliminating urinary inflammation, would on prostatic or vesicular massage give down pus containing gonococci; showing the absolutely false conclusion into which the acceptance, without further investigation, of the clear urine would have led.

STEPS OF INVESTIGATION

The several steps of this method of investigation may be briefly given as follows:

1. History of the case.
2. Inspection of the external genitals, for abnormalities, discharge, etc.
3. Securing smears of any discharge present, and staining by methylene blue and by Gram.
4. Double-glass urine test (leaving one ounce in the bladder for subsequent purpose). Centrifugalize both specimens, and examine sediment, both stained and unstained.
5. Rectal palpation of prostate and seminal vesicles, the finger protected by finger-cot well lubricated, a butter-platter held under the penis to catch the massage discharge. Massage applied first to right lobe of prostate, next to left lobe, then to right vesicle, and last to the left vesicle. Discharge subjected to the same tests, fresh and stained. Palpation determines physical condition of the organs felt, as to whether swelled, inflamed, tender, nodular, soft, hard, etc. If the massage has expressed no drops from the meatus, the next step should be
6. Passage of remainder of the urine into the third glass; which should be sedimented and examined microscopically in the same way (fresh and stained specimens of the sediment).
7. Use of bulb sounds for determining the caliber of the anterior urethra, and the presence or absence of strictures there. If this part of the canal is found free of abnormal contractions, a full-sized steel sound, say 27 or 28, French, is introduced into the bladder to determine the same questions for the posterior urethra.
8. In certain cases, for instance, of chronic urethritis, it may be desirable to substitute the use of the endoscope for the seventh step,

reviewing the urethral mucosa before its surface has been disturbed by the bulb sounds. In that case the bulbs are used directly afterwards, as step 8.

9. If the examination thus far has given rise to the suspicion of urinary obstruction, the next step is to determine the amount of that obstruction as indicated by the residual urine; a soft rubber catheter, sterilized, is introduced and drains the residuum into a sterile glass.

10. Residual urine of two or more ounces usually indicates obstruction at some point; its location and nature have yet to be determined. If the residuum has been drawn by a large-sized catheter, tight stricture as its cause is thereby eliminated, and suspicion of prostatic obstruction is correspondingly increased, whether or not enlarged prostate has already been felt through the rectum. This makes the tenth step in the examination that of *cystoscopy*, for the definite purpose of seeing the size, contour, location, and character of the prostatic overgrowths, and learning their exact bearing on the obstruction. The retrospective telescope, of the universal cystoscope (Fig. 1) is the one especially adapted to this purpose, although the direct and the right-angle telescopes give desired information regarding the remainder of the bladder and its contents, as to whether there are stones, foreign bodies, or tumors present, and their location.

11. If the examination thus far made excludes the bladder and low-urinary tract as originating the complaint, whatever it is, and there is hæmaturia, pyuria, or other condition whose origin is not yet defined, the next step is that of *double synchronous ureteral catheterization*, for the double purpose of sounding the ureters and of draining the urines from the respective kidneys and examining them in the several ways necessary.

12. If the history and other features of examination give rise to a strong suspicion of ureteral or renal calculus, the step now appropriate is that of *double synchronous ureteral catheterization, the catheters styletted with fine copper wire, and the taking of a skiagram by an expert radiographer.*

If this program of investigation is conscientiously carried out and the diagnosis is not cleared up or a mistake in diagnosis is made, I believe the condition to be a permissible one, because we have applied all the arts and sciences at our disposal to develop a complete diagnosis, and the failure must rest on the limitations of human capacity imposed on us all by nature.

But there are certain qualifications and elucidations that might properly be mentioned with reference to the mode of investigation sketched above.

It is believed that the sequence of the several steps as given should not be disturbed; that they should be carried out in the order given, unless some especial condition interferes. For instance, if one should use the bulb sounds before having the patient pass water into the two glasses, or before making the massage, or before using the endoscope, that in itself will alter his findings and perhaps lead to erroneous conclusions. He may obtain clouded urine or massage mucus streaked with blood, or an intensely congested urethral membrane, all from the effect of the sounding itself, without reference to any disease present.

The double-glass urine test, one of the most serviceable procedures at the disposal of the urologist, is capable of giving correct or false conclusions, according to whether it is applied correctly or incorrectly. The logic of the test is, that post-urethral inflammation gives both parts cloudy, while inflammation limited to the anterior urethra makes only the first glass cloudy; explainable on the ground that pus formed in the posterior urethra in connection with posterior urethritis passes back into the bladder and *clouds all the urine*, whether first, second, or third glass; while in anterior urethritis the urine in the bladder is unclouded before it starts from the organ; its first part (that in the first glass) becomes clouded by taking up the pus of the anterior urethra; while the second part (in the second glass) has a clean urethral channel to travel over, does not become clouded in transit, and therefore shows clear in the second glass. If, now, in case of posterior urethritis, the test be made so shortly after the previous passage of the urine that no time has been allowed

for the production or passage of the pus from the posterior urethra back into the bladder, the result will be fallacious: the first cloudy, the second clear, although there is posterior urethritis.

Therefore, in order to utilize this most valuable test one must observe the precautions necessary; that is, allow of sufficient time between urinations to permit the pus formed in the posterior urethra to carry out its natural program and drain back into the bladder, thereby clouding all of the urine. An hour should be ample for this; but the urine passed the first thing in the morning will probably give the most reliable result, and is therefore to be favored. It should scarcely be necessary here to mention that the *clouding* of the urine itself must be differentiated — as to whether it is from pus, phosphates, urates, spermatozoa or bacteria; and that guesses or presumptions should aever be made use of for the differentiation, nut reliance should rest only on the exact bgencies of microscope and chemical tests.

CALIBER OF THE URETHRA: STRICTURE. OBSTRUCTION TO SOUNDS

It is probable that more unwarranted assaults have been committed under the guise of treatment and operations for so-called "stricture" than for anything else related to this tract. Innumerable are the instances in which either cutting operations or prolonged treatments have been applied for the relief of strictures which have had no existence in fact. Faults of commission, as well as of omission, pertain to this subject.

The male urethra is properly and naturally of variable caliber, varying from 23, French, at the meatus, to 35 in the bulbous part, with intermediate variations, also. A bulb sound, size 23, will pass readily down such a urethra until it reaches a depth of about five or six inches, when it stops abruptly. Unless one is acquainted with the reason for this he may interpret it as an evidence of stricture at that point; and I have become acquainted with a large number of instances in which strictures had been diagnosed and treated, in one of the ways mentioned, for no more substantial reason than this. The cut-off, or compressor urethræ muscle, located here, resists the introduction of the bulb sound, although it permits the entrance of the conical sound without the slightest difficulty, provided there be no organic narrowing there. Therefore the bulb sound is a reliable guide for the determination of stricture in the anterior urethra, as far as the cut-off muscle, but absolutely useless deeper than that. On the other hand, a steel sound might easily pass into a moderately contracted stricture of the anterior urethra, gently prying it open as it enters, and give *absolutely no indication of its presence*: so that, thus improperly used, it may be not only worthless but actually misleading in its diagnostic indications. A sin of omission would then be committed — that of failing to find a stricture that is present.

The logical deduction from these facts is the following: To make use of the largest-sized bulb sound possible for the anterior urethra until the cut-off muscle is reached, at a depth of five or six inches; then to use a full-sized steel sound, say 25 or 27, French, until the bladder is entered. The obstruction opposing the entrance of the bulb sound by the muscle disappears on the introduction of the steel sound; whereas, if the obstruction is due to organic stricture at that point, it will obstruct the full-sized steel sound as well as the bulb, making the demonstration complete.

If the obstruction is due, not to stricture, but to prostatic hypertrophy, it will not be encountered at a depth of five or six inches, but posterior to that by two or three inches; and there will be other accompanying physical signs to confirm the differentiation.

Prostatic hypertrophy. If one should rest content with a diagnosis of "prostatic hypertrophy," simply, in these days, he would be committing several sins of omission at one time. Diagnosis relating to prostatic obstruction should embrace information on the following definite points: 1, as to whether there is prostatic hypertrophy; 2, as to whether it is producing obstruction; 3, the amount of that obstruction; 4, the character or confirmation of the obstructing body; 5, the condition and functionating capacity of allied organs, kidneys, heart, etc.

The first point may usually be determined by rectal palpation, with the patient bent over a chair, the hypertrophied prostate appearing to the palpating finger as a large, globular body, divided longitudinally by the furrow that normally separates its two lateral lobes. The fact that the prostate normally possesses but two lobes, the so-called third lobe being purely a pathological production, need not be discussed here.

Hypertrophy of the prostate thus demonstrated by rectal palpation does not settle the point as to whether there is obstruction from it. Many men have hypertrophied prostate without appreciating having obstruction from it. That point, and the next one, *the amount of such obstruction*, can best be determined by having the patient urinate voluntarily, then pass the catheter and draw off the urine left in the bladder. This is called "residual" and is a fairly good indicator of the amount of obstruction and backward pressure being exerted by the offending organ. It varies from two to twenty or even forty ounces or more. (Dudley.)

The fourth point in our quest, the character

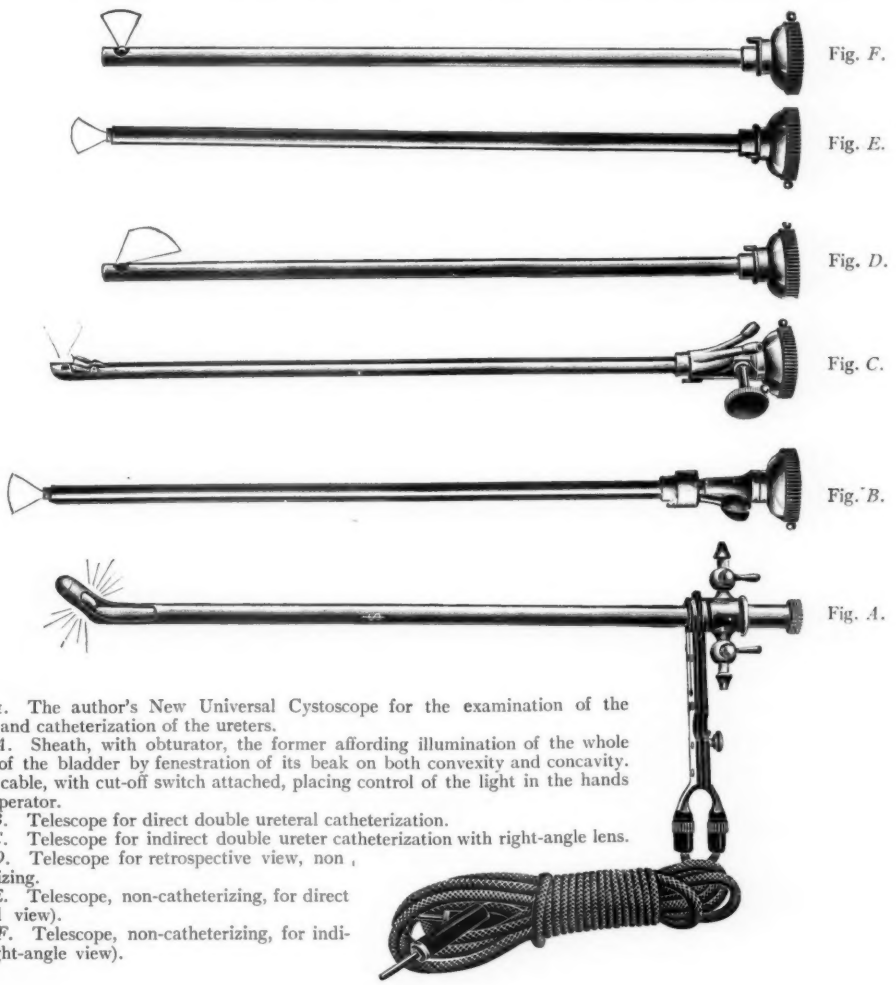

Fig. 1. The author's New Universal Cystoscope for the examination of the bladder and catheterization of the ureters.

Fig. *A*. Sheath, with obturator, the former affording illumination of the whole interior of the bladder by fenestration of its beak on both convexity and concavity. Electric cable, with cut-off switch attached, placing control of the light in the hands of the operator.

Fig. *B*. Telescope for direct double ureteral catheterization.

Fig. *C*. Telescope for indirect double ureter catheterization with right-angle lens.

Fig. *D*. Telescope for retrospective view, non-catheterizing.

Fig. *E*. Telescope, non-catheterizing, for direct (forward view).

Fig. *F*. Telescope, non-catheterizing, for indirect (right-angle view).

Fig. 2. Fig. 3.

Fig. 2. Bilateral prostatic hypertrophy. Spherical intravesical tumor acting as a flap closure to the urethral orifice. Operation of choice, high incision for stone. Perineal prostatectomy unnecessary. Bottini's operation not indicated.

Fig. 3. Bilateral prostatic hypertrophy with large corrugations and deep depressions posterior thereto. Perineal prostatectomy operation of choice, presupposing that patient's condition is favorable (strength, vitality, etc.); otherwise employ Bottini's.

or conformation of the obstructing factor, can best be attained by the use of the cystoscope, and more particularly the retrospective telescope supplied in the modern instrument. (Fig. 1, D.) This differentiation must embrace not only jutting lobes and intravesical outgrowths (Figs. 2, 3, 4A, 4B), but also the detection of the obstruction by what is termed "contracture at the vesical neck."

Prostatism without hypertrophy. This is just as effectual for making trouble, backward pressure, and damaged kidneys as is the other, the tumor-form of prostatic change. Briefly, the process of determining this sort of obstruction is the following: Having proved the existence of obstruction, with a definite amount of residual urine as its index, and having located the source of the obstruction at the vesical neck by the urethral soundings, already described, and having excluded general prostatic hypertrophy by rectal palpation, and intravesical outgrowths by cystoscopy, one is reduced necessarily to the conclusion of contracture at the neck, and without the necessity of actually feeling or seeing the contracture.

I was much surprised at observing, in a recent issue (March 27, 1909,) of the Lancet-Clinic a discussion on prostatic hypertrophy in which the following was quoted as coming from one of the Cincinnati surgeons: "A patient some weeks ago had passed through the hands of eight or ten physicians who diagnosed prostatic hypertrophy. A rectal examination revealed nothing. I was not satisfied, and made a suprapubic incision, but found no hypertrophied prostate. He had been out of a large hospital seventeen days, where he was prepared for its removal, and all believed he had a hypertrophied prostate. Had I not made a suprapubic incision I should have been in doubt. As it is, he had no hypertrophy, but an infected bladder. . . . A good surgeon makes a small incision with good drainage, very often for diagnostic purposes, to see if there is hypertrophy, or the third lobe described by Home." In view of the definite and clean-cut manner in which the several essential points for diagnosis of hypertrophied prostate may be determined without cutting whatever, I cannot subscribe to any such teaching nor forego the opportunity of contesting it. The bugbears of prostatic surgery are already

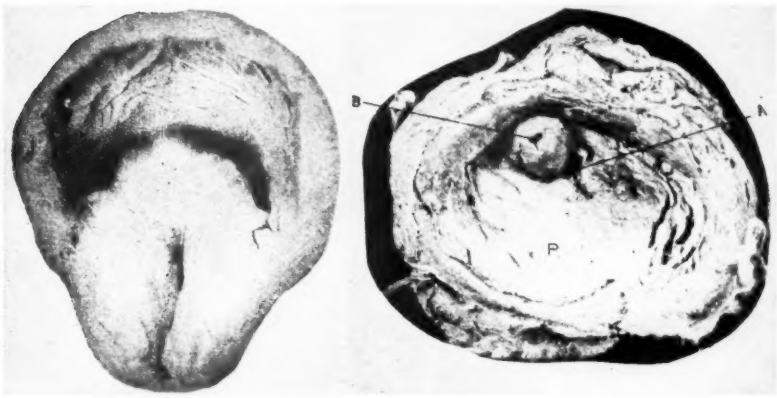

Fig. 4*A*. Fig. 4*B*.

Fig. 4*A*. Marked bilateral hypertrophy, unusually large, the two side lobes joining corrugations. The whole tumor extends so far forward in the bladder that it is filled and both ureteral orifices are compressed. Bottini operation useless. High stone incision, combined with above-mentioned, through perineum, the operation of choice.

Fig. 4*B*. Hypertrophied prostate intravesical, spherical tumor on the anterior commissure with a tendency to growth backward and in consequence interfering with the passage of urine. Enlargement of both lateral lobes. *A*. Urethral orifice. *B*. Blind cul-de-sac at upper end of tumor. *P*. Posterior wall of bladder. High stone incision operation of choice. Approach through the perineum is useless. Result with an anterior Bottini questionable. An actual preparation.

sufficient to frighten from its regenerating influence an unwonted number of the timid and ignorant; to erect additional ones that are unnecessary, such as cystotomy for diagnosis of prostatic hypertrophy, is unwarranted, to say the least.

The necessity for definite differentiation of the several possible modes of obstruction produced by prostatic deviation is apparent when we know that they require entirely different modes of treatment, both operative and methodic. The contracture does not necessarily require enucleation or prostatectomy for its relief; indeed, these might prove entirely inadequate and inappropriate. And, on the other hand, the electro-incision that would relieve the contracture might and probably would prove a complete failure for the other forms of prostatic obstruction.

On the accurate determination of the fifth diagnostic point (the condition of health of allied organs), may depend the success or failure of the operation, or the life or death of the patient, in connection with prostatic surgery. In these cases one is frequently impressed with the fact that the patient's ability to withstand needed prostatic surgery depends much more on the physical condition of his kidneys and cardiac system than on his age — as to whether he is fifty, sixty, seventy, or seventy-five years old. Many men are older, in their stability, at fifty than others at sixty or sixty-five; and yet it is a common thing for both patients and their physicians to decline all consideration of operation solely because of the age of the subject. A very considerable number of prostatics more than eighty years of age have been reclaimed to health and comfortable living by one or another form of prostatic operation, and without serious menace to their lives.

Seminal vesicles. The most prominent diagnostic pitfall with respect to the seminal vesicles is that to which allusion has already been made: that of overlooking them or ignoring them as a factor because the two urines of the double-glass test are clear and therefore appear to exclude the deep urethra and its community of organs from the pathological problem. I would here again repeat the precaution suggested of including these organs in the routine mode of investigation outlined.

Bladder. With a good, comprehensive

cystoscope included in his armamentarium, many of the pitfalls of vesical diagnosis are avoided, provided the surgeon is capable of using the instrument to advantage. The difference between the value and reliability of this instrument as compared with the stone searcher, in the diagnosis of vesical stone, is so great as to be incomparable. The searcher must *touch* the stone to be effective in its quest; and must touch it uncovered with mucus, blood or other material that may interfere with the "click" that forms its signal of the presence of stone. Whereas, the cystoscope has but to be brought within *range of view* of the stone in order to be effective for its discovery; and that, whether the stone lie in the vertex of the bladder, posteriorly, anteriorly, or in a pouch behind the overhanging prostate, something entirely beyond the range of possibilities of the searcher. Many are the instances in practical clinical life in which vesical stone escapes detection by means of the searcher, to be found later and plainly seen through the cystoscope. The moral of which is to place no final reliance on the searcher for determining this question.

The upper urinary tract. While there are other questions with respect to vesical diagnosis that might prove interesting for discussion, more important ones of the upper urinary tract demand our attention.

In inflammations and infections of the lower tract, where satisfactory progress for their relief is not obtained, or there is an unexplained resistance to treatment, I have found it an excellent rule to explore the upper tract by means of cystoscope and ureter catheters, even if no direct indications of trouble are coming from there. In a large number of instances this has thrown a flood of light on the case or even cleared up its obscurity and attained a short cut to relief.

I could not better illustrate this than by referring to a case, already published,[1] the chief points of which in brief, were these: The persistent recurrence, even without intercourse, of a gonorrhœa in a young man during a period of five years, the urethral discharge each time showing abundant gonococci. Consultations numerous and efforts at relief prolonged, in the East as well as in the West, always with the same result, recurrence after a month or two of freedom from the discharge. Finally, in February, 1906, he was brought to me by Dr. Jere Crook, of Jackson, Tenn. For two weeks I applied the various methods useful for eliminating infection from the lower tract, but without success. Resorting, then, to my usual procedure, the cystoscope was introduced. Three ureter openings were to be seen, instead of two, at the angles of the trigone, one on the right side, and two on the left. In due time three catheters were introduced into the three ureters; three different urines were received and examined, giving three different physical characteristics, but most important, showing gonococci in one of them, while the other two urines were healthy. Further, while the three catheters, armed with stylets of lead wire, were lying within the three ureters an X-ray photograph was taken by Dr. Carman, the result of which appears in the accompanying illustration, (Fig. 5). While these are remarkable and interesting facts of anatomy, physiology, and pathology, to the patient himself the interesting feature was that after two or three irrigations of the infected kidney pelvis with argyrol, plus continued attention to the lower tract, he recovered definitely and completely.

He has since married and has had no further trouble from his old complaint. The only way in which this patient could obtain relief and disinfection of his urinary tract was through cystoscopy, catheterization, and irrigation of the infected part. The infected ureter was acting as a perpetual source of renewal of the infection, sending down a fresh supply of gonococci as often as they were killed out by efficient treatment of the lower tract.

The segregator. The above mentioned case well illustrates, to my mind, the inadequacy of the segregator for either comprehensive diagnosis or treatment. Its use here would have failed in clearing up the diagnosis, in the first place, and would have afforded no assistance in reaching the infected ureter and pelvis with disinfecting medication.

Tubercle and smegma bacilli. I wish to call attention here to what I consider a prolific source of error in urinary diagnosis, and more especially pertaining to those who would be ultrascientific in their diagnostic methods. I refer to the ready possibility of confusing smegma with tubercle bacilli by depending on any of the differential staining methods commended in the text-bocks and writings on microscopic technique. I have erred in depending on these methods, on occasion, and in not a few instances have witnessed the serious consequences that have

[1] Medical Record, October 6, 1906.

ensued from too much reliance being placed on them by others. I believe that many an individual is put under the ban of a diagnosis of urinary tuberculosis, with all that that means, for no better a reason than that his urine was investigated by the microscopist after having been passed voluntarily and without precautions against including smegma bacilli in the specimen. For instance, the patient from whose left kidney the accompanying large L-shaped calculus was removed, in 1907 (of which a radiogram is shown in Fig. 6) was examined in 1899 by a leading surgeon and an expert pathologist, who united in the diagnosis of urinary tuberculosis, based on the clinical symptoms and the finding of supposed tubercle bacilli in the urine. He labored under that diagnosis for eight years thereafter, absorbing guaiacol and cod-liver oil to the limit, and of course obtaining no relief from the presence of the stone. In 1907, by ureteral catheterization and investigation of the urines from the two kidneys, plus radiography, we arrived at the correct diagnosis, removed the stone by lumbar nephrolithotomy (Fig. 7) with restoration of the patient's health and his ability to reengage in the practice of law, from which ill health had debarred him for a long period. Smegma bacilli look and behave too much like tubercle bacilli under the staining methods in vogue, for me to accept any of them as being reliable for differentiation. It is advised, therefore, that dependence be placed only on their rigid exclusion and manner of obtaining the specimen of urine that is to be investigated. Employ catheterization always, in both sexes; and only after thorough cleansing of the external genitals. Precautions are more necessary in females than in males because of the shortness of the urethral tract and the greater liability of smegma bacilli being inadvertently introduced.

Cystoscopy and ureteral catheterization. While time will not permit of extended discussion on the subject, I wish to bring up for condemnation two expedients that are often employed and even recommended by experienced cystoscopists of recognized standing. I refer to the reliance placed on:

(*a*) *The appearance of the ureteral openings* as they are viewed by the cystoscope, as an index of the exact condition of the corresponding kidney; and

(*b*) *The cystoscopic appearance of the urine* as it emerges from the corresponding kidney; and

(*c*) *The reliance placed on the cystoscopic appearance* of the urine as it emerges from the ureteral openings, without ureteral catheterization in either instance.

It is claimed by a number of writers that a tuberculous kidney will always show itself by abnormal appearances of the ureteral orifice below it: redness, swelling, pouting, etc. While I am ready to admit that the positive evidence thus given is of great value, and that it is frequently available, I wish to raise the point that the negative evidence is not to be thus relied upon, that the *absence* of the changes in the orifice does not justify a clean bill of health for the kidney above it. More than one operator has told me that he had removed tuberculous kidneys in which no untoward appearance of the corresponding ureteral orifice existed. If this be the case, a fatal mistake might be made in relying absolutely on the appearance of the orifice, without catheterizing the ureter.

Similarly, the acceptance of the macroscopic appearance of the urine as it comes in jets from the respective ureteral openings as an indication of its normal or abnormal condition, should be strongly condemned. If, with urine standing in a glass before one, it is necessary to use a microscope to determine whether there are red cells, pus cells, or epithelia in it, assuredly an attempt to settle these questions simply by observing the swirling urine, under the circumstances mentioned, is a fallacy that should neither be practiced nor taught. Assumptions should be shunned and exactitude should be conserved in all of these measures. It not infrequently happens that the urine of a patient seems and looks perfectly clear macroscopically, but sedimented and put under the microscope it is shown to contain numerous red blood cells or even a considerable number of pus cells, both very important factors in diagnosis that might readily escape detection without the use of the microscope. Indeed, I am under the impression that that is a com-

mon occurrence. I look on the occurrence in the urine, in microscopic quantities and over prolonged periods, of red blood cells as a sign prodromal to the onset of urinary tuberculosis, or at least in close alliance with it. Others have interpreted the sign as being especially suspicious of ureteral calculus (Ransohoff). But whether it indicates the approach of the one or the other condition, the point that I wish to make here is that the red cells should be detected in either case, and at an early period of their existence; and the only way they can be detected is by definite search with the microscope. And yet I have been acquainted with a number of patients who, I learned, habitually passed blood in microscopic quantities, but concerning whom the assurance was positively made by their consultants that their urine had never contained blood — the macroscopic appearances having been accepted for the determination of that very important matter.

The duty of the practitioner in the presence of hæmaturia. This is the question which the practitioner is often compelled to face: What is best to be done when the patient comes complaining of blood in the urine and presses for its immediate suppression? If we accede to his wishes we will at once prescribe stypticin, thyroid extract or ergot, for the purpose of stopping the hæmorrhage; and in doing so we may be doing him the greatest possible injustice. Our very success in attaining that object may delay the discovery of a malignant growth at some point in the urinary tract, may conserve its development until too late for our discovery of it to be of practical service, or may retard the demonstration of tuberculous infection until both kidneys are involved instead of only one; or may postpone operative relief from a kidney stone until the organ has been damaged beyond repair. One does not have to draw on his imagination in painting such miserable and unfortunate possibilities; they are met with a deplorable number of times in a year's clinical experience. At the present time I am acquainted with six or eight patients afflicted with inoperable cancer of the bladder, who are beyond all hope of reclaim by human assistance, and who never underwent definite diagnostic research until after the growth had been irreparably fixed on them. The necessary investigation had been postponed from time to time, reliance meantime being placed on medicaments used for the suppression of the symptoms or signs, the most startling of which is often the hæmaturia. If we could only appreciate it, this manifestation is, in such an instance, the most serviceable and conservative effort that could be vouchsafed by nature. The patient is to be congratulated whose cancerous growth betrays its presence early by such a fortunate indication — provided the advantage is not lost, the dénoument deferred, by its blind suppression with medicines without any effort at discovering its cause and origin being made.

Mode of determining the origin of blood or pus in the urinary tract. The approved mode of determining the source of blood or pus in this tract is by definite and minute search of the tract from end to end, by means of the several measures and means at the disposal of the diagnostician at the present day: the double-glass urine test, the cystoscope, ureteral catheterization, and radiography, as well as by the more usual modes of physical examination. Symptomatology and semeiology, while useful in certain respects, are not to be relied on for exact differential diagnosis.

Renal and ureteral calculi, the X-ray and ureteral catheterization. While we will not be able to go into the subject extensively, there are some points under this heading that I wish to touch on. One often hears, in medical discussions, strong expressions of opinion as to the "best" means at arriving at a differential diagnosis of calculus of the upper urinary tract, some announcing allegiance to careful analysis of the symptomatology for that purpose, others estimating the X-ray as all-sufficient, and still others placing their reliance on the use of the ureteral catheter. It is my belief that all three of these positions are untenable and incorrect in individual instances; that a safer, fairer, and broader position demands that we use *all* of the methods and means at our disposal, in suspected cases, and employ our time to

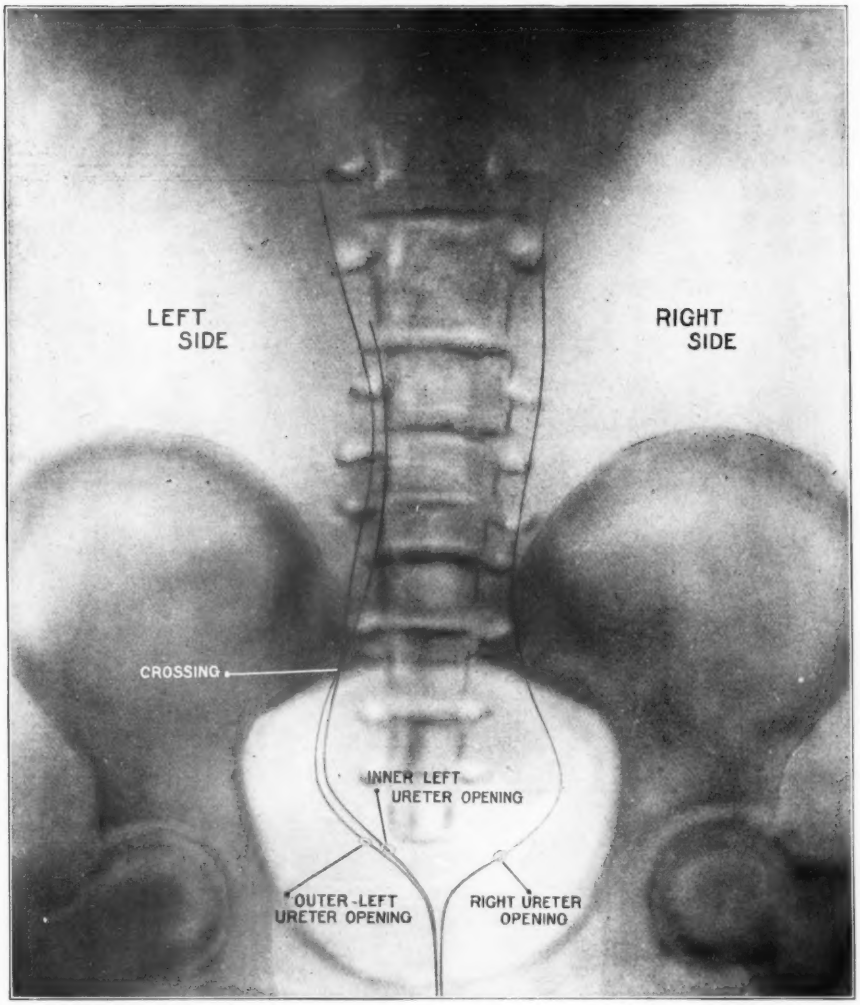

Fig. 5. Three ureters demonstrated during life. Ureter catheterization giving three different urines, one infected with gonococci.

better advantage than in discussing which is the best one. There is no doubt that each of the three means and methods mentioned above as the "best" may, at times, be misleading and lead to wrong conclusions, if accepted as final. The symptomatology of urinary stone is notoriously misleading, not a few instances being recorded in which the complaint is wholly referred to one side while the stone is located in the opposite kidney; and of others in which, on autopsy, a kidney is found to be wholly destroyed from sacculation, etc., without there having been any especial complaint on the part of the patient during life. In either instance symptomatology is deficient for attaining diagnosis or differential diagnosis.

The length to which such unreasonable

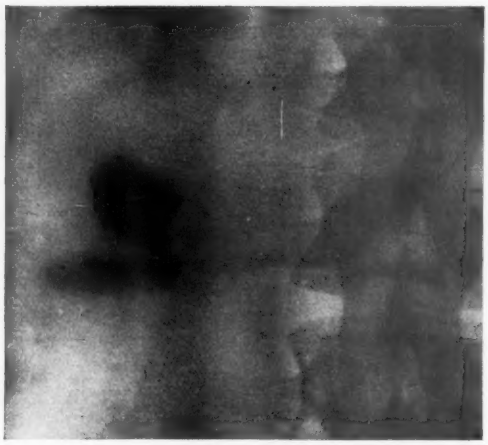

Fig. 6.

and eccentric symptomatology may go is well illustrated in the following case, personally communicated to me by Dr. George C. Crandall, of St. Louis:

Mr. F., age 45, foreman; complains that for several years he has experienced pain in the right lower abdomen, together with gastrointestinal disturbance, indigestion, and constipation. Two years ago the condition was diagnosed appendicitis and the appendix was removed, but without any relief to the symptoms. Afterwards arrangements were made for exploratory incision in the upper right quadrant of the abdomen, under the impression that there might be a gall-bladder or duodenal ulcer; this, fortunately, was deferred until after the consultation with Dr. Crandall. In his investigation the following were noted: Chest signs negative, abdominal signs negative except that there was definite tenderness in the *right* iliac region, the exact location in which there was subjective pain after working. This pain had, for several years, been of such intensity as to require him frequently to leave his employment and go home to lie down. It was further noted that the muscles of the right side of the abdomen were rigid to pressure and also when the pain was severe. Examination of the urine showed a few red blood cells, oxalate of lime crystals and epithelial cells. Under the tentative diagnosis of stone at some point in the urinary tract, an X-ray photograph was taken, which showed a small shadow in the lower part of the *left ureter*, a short distance from the bladder. This was interpreted as a stone; it was removed by incision, after which the patient recovered and has had no symptoms of the trouble since.

Evidently, symptomatology in this case was plentiful enough, but decidedly erratic and delusive. A correct deduction could not possibly have been made from it alone.

There are many instances in which there is marked complaint of ureteral colic on one side, the ureter catheter passes up a part of the way on that side and seems to be obstructed at a certain point, "the very place where the pain is," the patient may announce when that point is reached; and the suspicion of ureteral calculus at that site may apparently be strongly confirmed by this finding. And yet there may be no stone there or at any point in the urinary tract. The apparent obstruction to the passage of the catheter may be due to a sharp bend in the course of the ureter or to the catheter catching in a fold of its membrane, to be overcome by the use of a catheter of a different size or curve, or by an exchange in the mode of catheterizing, from the direct to the indirect method, sending the catheter into the ureter at a different angle and conducing to its more ready threading of the channel and making the ascent without obstruction. The marked variations in the curvature of ureters is shown by some of the X-ray photographs of them in my collection, illustrations of which are presented (Figs. 9 and 11).

Among the most interesting pitfalls to be encountered in this work are those now to be adduced: *The demonstration of shadows, simulating calculi, and apparently in the upper urinary tract, in a ureter or a kidney.* The vaunted X-ray, almost noble in its mighty potency, is guilty of this dreadful faux-pas, no matter how stoutly its adherents may proclaim to the contrary. Its testimony, taken alone and unsupported, is not to be relied upon in these cases, and he who does rely on it

Fig. 7.

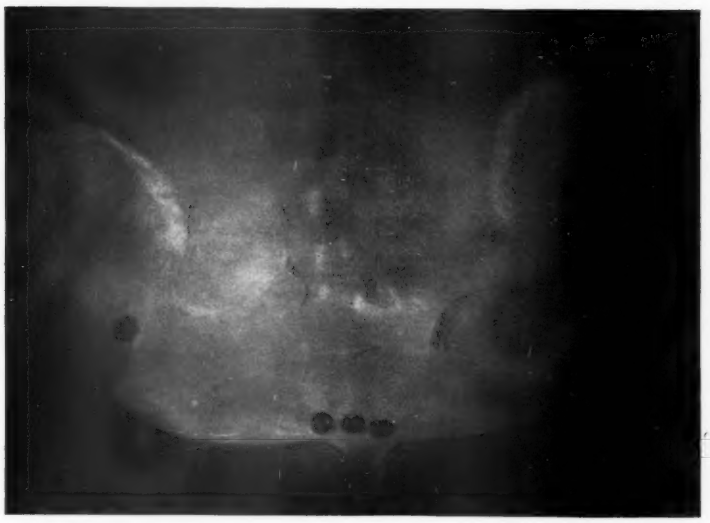

Fig. 8.

exclusively is in danger of finding himself in the embarrassing position of opening a kidney or ureter for the purpose of extracting a stone that does not exist. Witness the experience of so experienced a diagnostician and operator as Mr. Rigby, of the London Hospital, as related in the Annals of Surgery, 1908: "A male patient from whom a stone had previously been removed, was admitted into London Hospital Feb. 14, 1907, the present symptoms having begun in the previous month. They consisted of aching pain that radiated down along the course of the left ureter and involved the left testicle. The pain was always present but sharp exacerbations occurred two or three times a week. There was also pain in the glans penis after micturition; no hæmaturia. The urine contained a trace of albumin and some pus. A radiograph showed an indistinct shadow apparently due to a stone in the juxtavesical portion of the left ureter. On Feb. 22, 1907, the pelvic portion of the left ureter was explored by the pararectal route. The ureter was found easily. It did not appear to be abnormal. A small longitudinal incision was made in its wall and a ureteric bougie passed down to the bladder and up to the pelvis of the kidney. A stone could not be felt. The ureteral wound was sewed up and the patient recovered and obtained complete relief from his symptoms."

While I have in mind a number of cases that confirm the position I take in this matter, I shall mention one as further illustrating the fallacy of the X-ray if used exclusively and without the advantage of ureteral catheterization.

A young woman of St. Louis began suffering from severe pain in the right side of the abdomen one year ago. It became so severe and persistent that it was diagnosticated as appendicitis and the appendix was removed. But the pain persisted. A general practitioner was called into consultation, he and the general surgeon having charge of the patient then for nearly a year without arriving at a definite and satisfactory diagnosis. At their suggestion, in November, 1908, an X-ray photograph was taken (shown in Fig. 8) which, taken in connection with the evidences obtained up to that time, appeared to be very significant. It showed three shadows in the midline of the pubic region and a fourth apparently in the course of the left ureter, low down. No shadows in the right ureter or kidney. The conclusion was reached that if these were shadows of calculi, they indicated three stones in the bladder and one in the left ureter towards its lower end; and in all probability represented a case of transposed pain, in which the pain, although referred to the right side all of the previous year, was

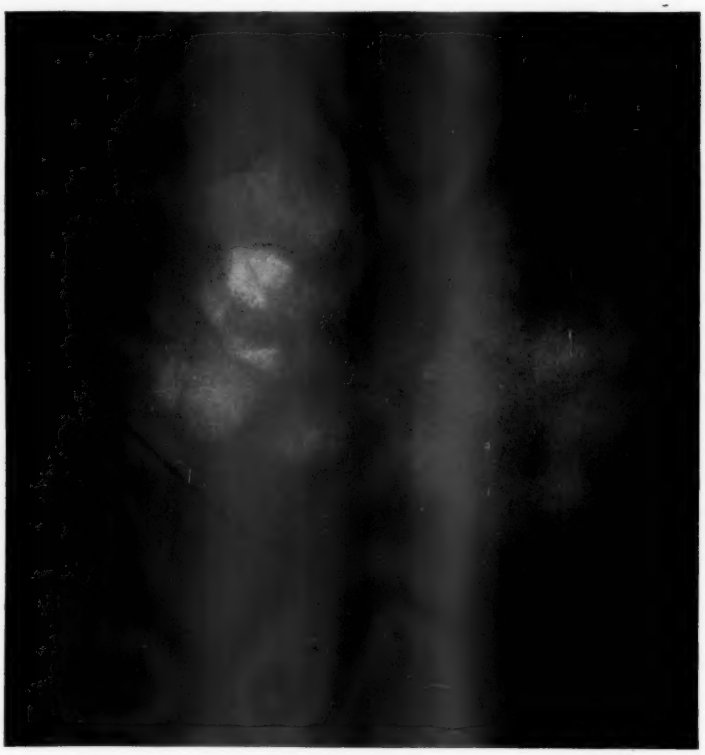

Fig. 9.

really coming from the left side — the left kidney and ureter.

At this time I was called into consultation with the two gentlemen, and was shown the X-ray plates with the above findings. With native Missouri instinct, I desired to be shown further evidence before committing myself on the diagnosis. We then carried out the following procedure: Inserting the cystoscope, we could see, as plain as day, three calculi about the size of a pea, lying in the base of the bladder, confirming definitely the previous X-ray plate; catheters armed with copper wire stylets were then introduced into the two ureters up to the pelves and an X-ray was taken by Dr. Carman. This picture (Fig. 9) showed the four shadows, also, but, more important still, *it presented the fourth shadow a half or three-fourths of an inch distant from the left ureter*, instead of in its course; and was clearly, therefore, no calculus but probably a phlebolith, an "innocent by-stander," so to speak. These three vesical stones were easily removed by means of my operative cystoscope, and are shown herewith.

The origin of the three calculi recognized in the bladder was not yet made clear, and would not have been made clear by the X-ray evidence, alone, any more than the four shadows were explained by the X-ray. They must, of course, have descended from one or the other of the kidneys, but which? The cystoscope and ureteral catheterization defined that as clearly as possible. The left ureteral orifice was normal; the right was widely patent and moderately congested, with pouting lips. The left ureter catheter gave clear, healthy urine, free from pathological contents; while the right drained cloudy, purulent urine, and the right pelvis was demonstrated to have considerably more than the normal capacity, all going to identify the right side as the source of the calculi, the pyelitis, and the prolonged suffering.

Since writing the above, another case has been referred to me in which the appendix was removed in the belief that it was the origin-

Fig. 10.

ator of the intense suffering experienced in the right side of the abdomen by a female patient. The appendectomy afforded no relief from the pain; during three weeks following it chloroform had to be given eight or nine times, and for one or two hours at a time, to alleviate the excruciating agony, as related by the physician in charge. Ureteral catheterization plus X-ray with styletted catheters excluded stone and defined the diagnosis as one of colon bacillary infection of the right kidney pelvis and ureter; and repeated irgations of these organs with argyrol through the ureter catheter gave prompt and continued relief.

I recently had a third case in which there was colon bacillary infection of both kidney pelves, without calculus; the right was suppurating to a moderate degree, while the left sent down such masses of pus and bacteria that a glassful of urine passed voluntarily gave a sediment of about one-third to a half in bulk. At first sight it seemed that there was little hope of saving the left kidney, so seriously was it involved; but frequent pelvic lavages through the ureteral catheters afforded unexpectedly prompt and great benefit, so that he was sent back to his physician within two weeks after his arrival, showing urine, then, that was only slightly cloudy.

In our collection of X-ray plates are a number in which shadows appear to be in the line of a ureter, and in connection with appropriate symptoms, might readily be interpreted as meaning ureteral calculi (Fig. 10); but use of the ureteral catheter, with and without the wire stylet and X-ray, has shown them to be nothing more than phleboliths or calcified glands, etc. (Fig. 11).

The comparatively low esteem in which cystoscopy and ureteral catheterization seem to be held by general surgeons and others of the present day appears in a survey of the late literature on the subject. For instance, in reviewing a most excellent contribution on the subject by Deaver, Dr. W. D. Haines, in Lancet-Clinic, p. 642, 1907, makes this his opening remark: "The diagnosis of

Fig. 11.

ureteral calculus by means of certain definite symptoms, confirmed by X-ray findings and operation, in the past few years, has demonstrated that stone in the ureter is not so infrequent as was formerly supposed." The important bearing of cystoscopy and ureteral catheterization in developing present day knowledge on the subject, is not even mentioned, you note; and in the paper of Deaver, of which this is a review, scarcely more credit is given these factors. It is therein declared that "the difficulty in reading symptoms pertains rather to localization than to the presence or absence of stone; and he agrees with Freyer, who says that kidney and ureteral stone symptoms are so nearly identical as to render differentiation impossible, judged from a symptomatic standpoint." Both of these eminent gentlemen agree in these deductions, according to Dr. Haines, and likewise commend the practice of exploring the kidney when in doubt, passing a sound down the ureter before concluding the search for stone. Just why it is preferable to sound a ureter through a surgically opened kidney, rather than through the bladder by means of a cystoscope, with the several organs intact, is not explained.

In a paper on "The Diagnosis of Surgical Diseases of the Kidneys," [1] by my friend, Dr. J. Garland Sherrill, the author reminds us of old times when he says: "The differential diagnosis between pus from the kidney and purulent cystitis may be made with fair accuracy by thoroughly washing out the bladder until the water runs clear, then after a few minutes delay drawing off the urine which has collected. If this specimen shows pus in about the same proportion as the

[1] Lancet-Clinic, March 3, '06.

former one, we may feel assured that we are dealing with a renal pyuria. If on the other hand the urine is clear we may know that the trouble is located in the bladder." When compared with the definite and precise methods of cystoscopy and ureteral catheterization, this method reminds me of the plan I once heard advised for diagnosing the sex of a canary bird: To get up early in the morning, secure a fat, attractive-looking worm and give it to the "suspected" bird; if he eats it, it is a male; if she eats it, the sex is feminine.

Although we are not expected to deal with the *treatment* of ureteral calculus in this paper, I cannot refrain, in this connection, to question the position, almost universal with general surgeons of the present time, to ignore the claims for recognition of *cystoscopic* operative methods for the removal of a certain proportion of calculi that lodge or become impacted in the lower end of the ureter. Practically the only methods advocated for such removal are the several cutting operations, through the vagina, the abdomen, the bladder, etc., in the face of the fact that within the past few years a large number of stones have been removed from the lower ureter by non-cutting manipulations through the cystoscope. In this city of Cincinnati, in 1904, before the Mississippi Valley Medical Association, I had the honor of presenting a detailed "Report on Operative Work in the Ureter Through the Catheterizing and Operative Cystoscopes," later printed in the Lancet-Clinic of March 4, 1905, in which was described the several instruments and appurtenances and the planned campaign that I had devised for the purpose indicated in the report, together with relation of experiences that had been met with up to that time. That further experience, as well as that mentioned in the report, has amply justified the position then taken with regard to the method may be inferred from the collection of calculi which I now show, which were removed in this way, and without any cutting or heroic measures being adopted.

The position taken, then and now, is that if such stones are amenable to removal in this way, it is far safer and for many reasons more acceptable to patients than any of the more heroic, cutting methods; and they are capable of being removed in that way in numerous instances.

However, our chief concern at present is with regard to urinary diagnosis. It is evident that, from lack of time, if for no other reason, one cannot review all of the pitfalls lying in wait for the urinary diagnostician; but I have thought it possibly worth while to submit the above considerations in the hope that they may point the way to surmounting some of the difficulties and simplifying some of the problems connected with the subject. If any one lesson be contained in a candid study of the subject, it is the necessity of subjecting to the scrutiny of direct, methodic, scientific investigation, rather than to futile analysis of symptoms, all obscure or difficult urinary cases; together with the recognition and avoidance of the numerous pitfalls that lie in the path of the unwary in this field of work.

DEPARTMENT OF TECHNIQUE

MULTIPLE MYXO–CHOLESTO–LIPOMATA[1]

Case Report with Pathological Findings

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The following case presents sufficiently interesting clinical and pathological points to merit its report.

The patient was a married woman, aged 32, mother of two children, both living and well, and aged five and eight years. The family and previous history have no apparent bearing in the matter. The patient always had enjoyed the best of health. She had had, however, for eight years, a small tumor in the upper part of the calf of the right leg, but as it had long since ceased to grow and had never caused her any pain or inconvenience, no attention had ever been paid to it. In September of 1907 a small tumor developed in the left groin. At or about the same time she discovered a tumor in the left breast, in its upper and outer quadrant. She was conscious at this time, too, of a change in her waist measurement. In November, 1907, she consulted one of us (F. P.) in regard to her condition, she having by this time discovered that her increased waist measurement was due to some intra-abdominal growth. The tumor in the left breast was removed under local anæsthesia and a frozen section diagnosis of lipoma made. On examination in December, the following points were noted: A strong, healthy, robust woman, conjunctiva and skin clear, tongue clean, lips red, subcutaneous fat and musculature well developed. Heart and lungs were negative. Pelvic examination reveals small lacerations of perineum and cervix, otherwise negative. Three subcutaneous and two intra-abdominal tumors were discovered, located as follows: one in the upper and inner aspect of calf of right leg, about the size of a lemon; one on the anterior surface of the left thigh, just above Poupart's ligament, and one in the left breast; the two latter being about the size of a hen's egg. Of the two in the abdomen, one lay to the left and slightly below the umbilicus, and was about the size of a cocoanut. Its lower border was about three fingers' breadth above the pubes but the tumor being freely movable, it could without difficulty or pain be made to disappear beneath the left costal margin. The other tumor was situated just above the crest of the left ilium, resembled both in size and shape a kidney, and had a slight range of movement. Fluctuation could not be elicited in either one, and both were considered to be solid tumors, probably fatty. Entire absence of subjective symptoms. The patient ate well, slept well, and felt well.

Operation, January, 1908. (E. W. M.) Incision through the lower one-third of rectus muscle. On opening the peritoneal cavity, a large, grayish pink tumor presented itself. Crossing the tumor on its inferior surface was the transverse colon, the layers of the mesocolon spreading out and completely enveloping the tumor and uniting again posteriorly as they approached the mesenteric root. The colon was embedded in a shallow groove and it seemed evident that the new growth could not be removed without seriously jeopardizing the blood supply of the former. A resection of the colon was then considered.

The propriety of such a serious operation seemed at first questionable in view of the following points: 1. The presence of a similar growth in the mesentery of the descending colon. 2. The rapid growth of the tumor, there having been during the one month that the patient was under observation prior to the operation, a perceptible increase in its size. 3. The presence of supposedly similar growths, three in number, in the subcutaneous tissue of leg and trunk. 4. The macroscopic appearance of the tumor was suggestive of malignancy.

Favoring the benignancy of the growth was the entire absence of any evidence of peritoneal irritation, such as serous or hæmorrhagic exudate or adhesions or miliary deposits in the peritoneum, the apparent encapsulation of the tumor, the healthy appearance of the transverse colon, there being no infiltration or thickening of its walls, nor any change in its peritoneal coat, and finally a laboratory diagnosis of a myxolipoma, benign, from a frozen section, a piece of tissue having been removed soon after opening abdomen. The probability, in the near future, of an intestinal obstruction had to be considered also. In view of the subsequent clinical history and the autopsy findings, the development of such a condition was extremely unlikely. It was decided to remove

[1] We have characterized this tumor as a "Myxo-Cholesto-Lipoma" because of the large cholesterin content, which is shown by the double refracting substance which is not present in ordinary myxolipoma.

the tumor together with some six or eight inches of the transverse colon. The continuity of the gut was restored by side to side anastomosis. Assuming that the growth in the descending mesocolon was similar in nature to the one removed and therefore benign it was thought wise to delay its extirpation until some future time, its position being such as to necessitate a resection of the bowel in its removal. The patient made a good recovery, leaving the hospital in three weeks. In June, 1908, she noticed that her abdomen was increasing in size; examined in July, 1908, a moderate amount of fluid was detected in the abdominal cavity. The tumor just above the crest of left ilium had increased in size and a large tumor mass was felt in the epigastric and left hypochondriac regions. Both legs were œdematous. A second laparotomy was considered, but the dread of an operation together with a gloomy prognosis deterred the patient from consenting. She was next seen in September, 1908. The abdomen had become greatly distended, size of a full term pregnancy, marked œdema of both legs, considerable dyspnœa and great emaciation. The distention of the abdomen was largely due to ascitic fluid, and on tapping, five quarts of clear straw-colored serum were withdrawn. The tumor masses mentioned above had increased in size and a hitherto undiscovered one was found in the right iliac fossa. The patient was still able to be about and attend to her household duties. No pain or gastrointestinal disturbance. The ascitic fluid reaccumulated rapidly and frequently tapping was necessary. The œdema of the legs increased, the skin in many places rupturing and allowing escape of serum. Eventually the abdomen became entirely filled with the tumor mass, the emaciation progressed, and death occurred January, 1909.

AUTOPSY

Medium sized female body, no rigor mortis, no decomposition, great emaciation. Dependent portions of body show hypostatic discolorations. In the region of both tuber ischii there is a beginning decubitus. Hair and teeth well preserved. Mucous membranes are bluish red in color and somewhat dry. Face is grayish blue in color. Buccal fat entirely absent. Skin lax and dry. Superficial facial veins very prominent. Skin of upper extremities shows a bluish discoloration especially on the forearm and hand. Musculature of both arms greatly atrophied and relaxed. Skin in breast region of a dirty white color, wrinkled, very dry, and atrophic. Both mammary glands completely atrophied. The areolæ highly pigmented. A freely movable tumor was present in each breast, one about the size of a small apple, the other about the size of a fig. Abdomen greatly distended, circumference 91.5 cm., and of a semi-elastic consistency. In the hypogastric regions are numerous pigmented striæ. Slightly to the left of the linea alba and beginning 2. cm. below the umbilicus is a well healed scar 15 cm. long. In the left inguinal region is an egg-shaped tumor freely movable under the skin. Both lower extremities are œdematous especially below the knees. Skin very pale. On the inside of the right leg over the head of the tibia is a tumor about the size of a fist, apparently originating in some of the deeper structures, muscle, or fascia. It was not movable on the underlying structures. The subcutaneous fat over the entire body had almost completely disappeared, the few remaining fat elements being deep yellow in color. The musculature was greatly atrophied, œdematous and of a glassy pale red appearance. The abdominal cavity contained 300 cc. of clear straw-colored fluid. The parietal peritoneum below the umbilicus was adherent to the underlying structures. Filling the abdominal cavity was an immense tumor mass embedded in which were the abdominal organs. Beginning about four finger's breadth below the ensiform cartilage it spread out like a huge omentum until it touched the pubes. On the right side only were a few agglutinated coils of small intestine visible. The tumor was yellowish pink in color, somewhat translucent, and of a gelatinous consistency. Embedded in it were many small and large irregularly shaped opaque yellowish white masses. A thin connective tissue capsule can be stripped away from the tumor. The new growth was 32 cm. long, 20 cm. wide and 6 cm. thick and was adherent to the under surface of the liver. The remains of the transverse colon crossed over behind the tumor while the ascending and descending colon were almost completely surrounded by it, and could with difficulty be separated from it. The small intestines were matted together by delicate adhesions and the mesentery studded with small tumor masses. A large tumor, size of an orange, was also present in the gastrohepatic ligament and had pushed the stomach forward. The spleen was deeply embedded but could easily be separated from the tumor mass.

Thoracic cavity. Costal cartilages show beginning ossification. The diaphragm was at the level of the fifth rib. The anterior mediastinum and the pericardium were almost completely covered by lung tissue. The left cavity contained 400 cc. of clear, straw colored fluid; the right cavity 500 cc. Apex of left lung was adherent to the chest wall by a broad band of adhesions. In the right pleural cavity was a smooth spherical tumor size of an infant's head, not adherent, subpleural, and attached to the region of the spine by a small pedicle, about the level of the 5th and 6th dorsal vertebræ. Lying on the 6th dorsal vertebra were two small oval subpleural tumors 3 by 2 cm. The lower lobe of the right lung was compressed against the spine by the large tumor above mentioned. Upper and middle lobes of right lung adherent to costal wall.

Right lung. Weight 426 grams. Evidence of old adhesions on its surface. Upper lobe grayish red in color, lower lobe dark blue in color. One small bean-shaped subpleural tumor was found on the surface of the lower lobe, yellowish white in color. Three similar tumors were found near the root of the lung. On section, upper and middle lobes are œdematous, and on pressure frothy, bloody serum escapes. Lower lobe completely air free. On section it is tough and leathery, and dark red brown in color. Bronchial glands are enlarged and anthracotic. Large bronchi contain a small amount of mucus, and their mucous membrane is congested. Veins and arteries are normal.

Left lung. Weight 465 grams. Upper lobe grayish brown red in color, and of a doughy consistence. Delicate adhesions about the apex. Upper part of lower lobe is of a doughy consistence, lower part tough and solid. On

section the upper lobe is grayish white in color and on pressure a small amount of frothy serum escapes.

Heart. Weight of heart 120 grams; 7 cm. long, 7 cm. wide. Left ventricular wall 1 cm. thick, right ventricular wall 2 m.m. Slightly elevated white patches around both coronary arteries. Abdominal aorta shows a few ovoid, slightly elevated white patches. Lower lobe tough and nearly air free. Bronchial glands enlarged anthracotic and show evidence of calcification.

Condition of bronchi same as on right side.

Liver. Small, weight 1,160 grams; 18 cm. long, 23 cm. wide, 5 cm. thick. Inferior surface covered with numerous, small slightly embedded tumors. Superior surface covered with a flat tumor mass which was adherent to diaphragm. Capsule of Glisson is white and somewhat thickened. On section the liver substance is brownish red in color, acini indistinct, portal veins greatly dilated. Gall-bladder small, whitish in color, walls thickened and contain a small amount of pale green bile.

Pancreas. Firm, small, and grayish white in color.

Intestinal tube. Stomach small and collapsed, serous coat smooth with few tumors, fragments adherent. Contains a small amount of reddish fluid. Mucous membrane atrophic and spotted with numerous petechial hæmorrhages. Duodenum and upper part of jejunum contain a few bile-colored masses. Mucous membrane bile stained slightly atrophic and œdematous. Lower jejunum and ileum contain a few soft fæcal masses, mucous membrane deeply injected in parts. Patches not visible.

Cæcum and appendix normal. Ascending colon contains a few fæcal masses, walls very thin. Mucous membrane atrophic and injected. Transverse colon same. Unable to find after a careful search the point of anastomosis. Descending colon greatly atrophied, walls thin and transparent and containing a few fæcal masses.

Sigmoid flexure and rectum contain a few fæcal masses, walls thin, almost transparent and deeply injected.

Uterus and adnexa were embedded in tumor mass and were enucleated with difficulty. Tubes and ovaries were normal. On section musculature of uterus was firm and pale. Vessels easily seen. External os shows scar of old laceration.

Spleen weighed 92 grams; 10 cm. long, 6.5 cm. wide, 3 cm. thick. Adherent to thickened capsule were small fragments of the tumor tissue. On section it was dark red in color and of a firm consistence. Trabeculæ easily seen. Malphigian bodies indistinct. Veins dilated and thickened.

Left kidney. Weight 195 grams; 11 cm. long, 5 cm. wide, 2 cm. thick. The slightly thickened whitish capsule stripped away easily. On section dark reddish brown in color, firm consistence; cortex $\frac{3}{4}$ m.m. thick and shows pale reddish yellow striations. Medullary portion not sharply defined. Blood-vessels dilated and remained patent on section. Pelvis dilated and its mucous membrane injected. Near the kidney was a spherical subperitoneal tumor. Weight 200 grams; 10 cm. by 5 cm. by 5 cm. On section it was found to be similar in character to those found in the mammary glands.

Right kidney. Weight 192 grams; 12 cm. long 5 cm. wide, 2 cm. thick. Morbid anatomy practically the same as that of the left kidney, except that the pelvis was somewhat whiter and showed petechial hæmorrhages. Both ureters were dilated and filled with urine. Unable to find either suprarenal capsule.

Bladder empty, mucous membrane slightly congested.

The skull was not opened.

Tumor in the right leg was ovoid in shape and weighed 180 grams. Dimensions 6 by 5 cm. Covered by a thick muscular connective tissue capsule which was adherent to the intermuscular fascia between soleus and gastrocnemius muscles. Elastic consistency. Cut surface bulged and showed two distinct sharply circumscribed areas, one yellow in color, and opaque, the other myxomatous and transparent. In several places there were pure white irregularly shaped areas. Tumor in left inguinal region weighed 60 grams. Dimensions, 6.5 x 6.5 x 3. Egg-shaped, encapsulated, easily enucleated; soft consistence. On section it was pale yellowish red and homogeneous. Tumor in left mammary gland weighed 78 grams, dimensions 8.5 x 5 x 4 cm. Irregularly lobulated. Tumor in right mammary gland weighed 12 grams and was 4 cm. in diameter. Tumor in right pleural cavity weighed 851 grams. Dimensions, 14 x 11 x 10 cm. Sperical in shape.

The gross appearance or section of these three tumors is similar to that described for the tumor in the left inguinal region.

Pathological diagnosis. Marked emaciation and anæmia. Multiple myxolipomata. Brown atrophy of heart and liver. Bilateral hydrothorax. Œdema and atelectasis of both lungs. Ascites. Beginning hydronephrosis bilateral. Atrophy and passive hyperæmia of intestinal tract. Cyanotic induration of spleen. Œdema of both legs and labia majora.

The tumor removed from the mesocolon in January, 1908, weighed 850 grams. Dimensions 14 x 11x 9 cm. Spherical shape and of a homogeneous yellowish white myxomatous appearance. Attached to it was a six-inch section of transverse colon, together with the great omentum.

Microscopical examination of heart, spleen, liver, and kidney:

1. Brown atrophy of heart and liver.
2. Walls of blood-vessels enormously thickened.
3. Cyanotic induration of spleen.
4. Kidney shows cyanotic induration and interstitial hyperplasia.

The brain and spinal cord were not examined.

The pathological anatomy presented by this case is extremely interesting and at the same time somewhat confusing. The question arises as to the relationship between the tumor in the right leg of eight years' duration and those which later developed in the other parts of the body. One might naturally infer that the eight-year tumor retrogressed into a malignant growth with metastases. It would hardly seem probable that it was malignant from the beginning. At the autopsy it was found to originate in the intermuscular fascia. Lipomata may become sarcomatous through retrogression of their connective tissue stroma, and in this transition the connective tissue first becomes myxomatous. This malignant degeneration is most often seen in those lipomata which are intermuscular in origin. On the other hand it is not unlikely that the tumor in leg was from the first a myxolipoma and bore no relationship whatever to those developing in other parts of the body. In other words, there existed in this patient a tendency for certain tissues to undergo tumor formation. We see a tendency of this kind in certain benign tumors, for example, multiple

lipomata and fibromata. Certain points exhibited by this particular tumor favor such a hypothesis.

1. Each tumor had a well-defined capsule.
2. There were no typical metastatic deposits by way of blood or lymph channels.
3. There was no infiltration or destruction of normal tissue.
4. All of the tumors developed in the subcutaneous or subserous fat.

Its malignant qualities were rapid growth, local recurrence, and mechanical interference with the normal functions of the body, and these were sufficient to warrant a clinical diagnosis of a malignant growth. The cellular pathology, however, is not in harmony with the histological picture ordinarily considered to be characteristic of sarcoma. We have been unable to find an analogous case in the literature on the subject.

Death in this case seemed to be due, not to toxæmia or metastatic emboli, but to the enormous demand made on the body for the nourishment of this tumor, and to mechanical interference with the more important physiological functions, as shown by the ascites and anasarca of lower extremities, due to various venous obstruction, hydronephrosis and hydroureter from pressure on ureter, and finally, embarrassment of the respiratory function from the pressure of the immense tumor in the right pleural cavity. It has to be noted in this case also that the lungs, liver, and spleen were free from embolic deposits, which is certain evidence that metastasis through the blood stream did not occur. Whatever the histological picture of this tumor may be, benign or malignant, it is of interest mainly to the pathologists. The clinical picture is definitely malignant, and it is in cases of this character especially that the clinician and pathologist must combine their forces in order to reach a rational conclusion.

The more we study cellular pathology the less able we are to define the borderland between innocent and malignant growths. It is this uncertainty as to diagnosis and prognosis that prompts the surgeon to follow the practice of removal whenever practicable, at the earliest possible moment.

MICROSCOPICAL EXAMINATION

Frozen section hematoylin-sudan-glycerine. Under low power the tumor tissue consists largely of cellular mass taking a deep blue stain and infiltrated with yellowish drops grouped together in various sized clumps.

Under high power (ocular 4, obj. 7) the cells appear star-shaped, with a spindle or oval-shaped cell body, more or less rich in chromatin. The star-like projections take a pale blue stain and have a hyaline glassy appearance. The nuclei are vesicular in type and contain a nucleolus and numerous chromatin granules. Between the star-shaped cells are numerous cells of varying size without projections, containing granular protoplasm and taking a pale blue stain. In some portions of the section this pale blue granular protoplasm is filled with fine yellow drops. In other portions the cells are completely filled with large yellow drops obscuring the nucleus and replacing the protoplasm. Extracellular fat drops are also present.

Fig. 1. Ocular 4. Obj. 8. Section of breast tumor showing acidophile lipoid cells.

The entire tumor is well supplied with blood through large and small capillaries. Occasionally a vessel with thick walls is noted. Capillary walls are very thin and their cells spindle-shaped. The walls of the thicker vessels consist of a fibrillated tissue taking a pale blue stain. The various coats are not well differentiated.

TUMOR IN THE ABDOMINAL CAVITY

Section hardened in formalin and cut in paraffin. The tissue is rich in polymorphous cells which have an irregular distribution, in some portions of the sections, being widely separated, in others closely packed together.

The intercellular substance is granular and without definite structure, though in certain places it resembles a fine network. It stains irregularly with hæmatoxylin eosin pale pink and grayish blue. With Van Giesson it stains red, yellow or yellowish red. In but few places are the star-like cells well preserved. The cells are of multiple shapes and sizes varying from round to spindle. Many of them are very rich in chromatin, the nucleus under high power being entirely black. The chromatin usually takes the form of granules, though in places it occurs in masses. The protoplasm is scanty and in some of the cells is entirely absent, the nucleus alone being visible. This poorly developed protoplasm takes a pale blue gray or pink stain. A few cells ovoid in shape have a large quantity of protoplasm which takes a homogeneous dark red stain, while the protoplasm appears finely granular. Nuclei are of the vesicular type, with fine chromatin network. These cells correspond to those which in the frozen sections are filled with fat. When cut in paraffin, however, they appear as vacuoles, and when lying closely together give a honeycombed appearance. A thin wall can be

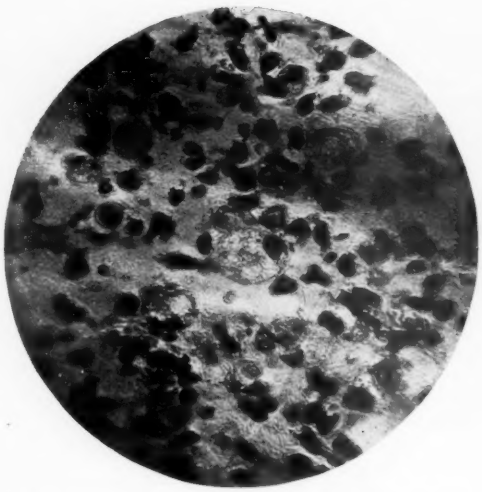


Fig. 2. Ocular 4. Obj. 8. Section of abdominal tumor showing lipoid cells with honeycomb framework.

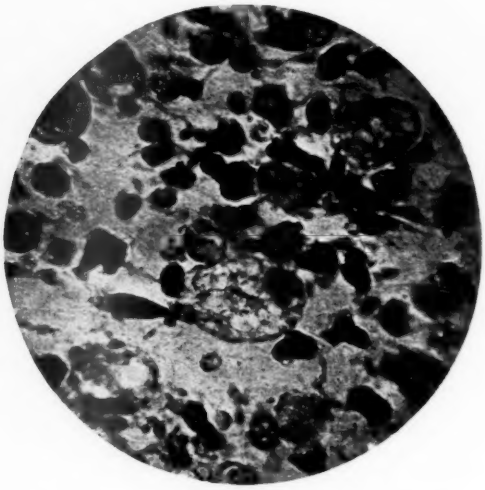


Fig. 3. Ocular 4. Oil immersion $\frac{1}{12}$. Same section as Fig. 2 showing lipoid cells with honeycomb framework.

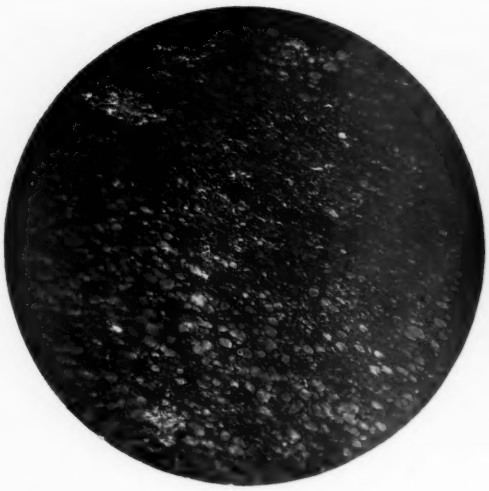


Fig. 4. Ocular 4. Obj. 1. Section from abdominal tumor.

Fig. 5. Ocular 4. Obj. 4. Same section as Fig. 4.

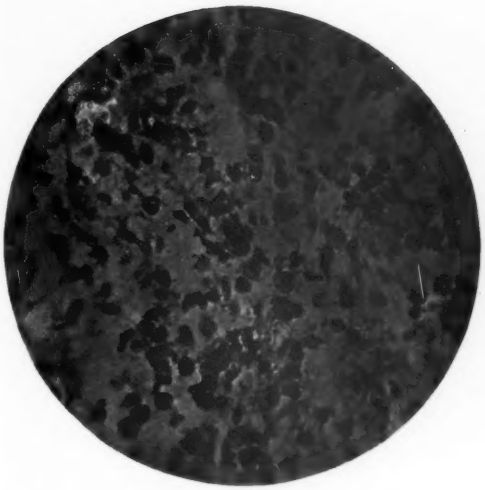


Fig. 6. Ocular 4. Obj. 4. Section from tumor of breast.

Fig. 7. Ocular 4. Oil immersion $\frac{1}{12}$. Section from tumor of breast showing finely granular acidophile cells. These cells later become filled with a lipoid substance.

Fig. 8. Ocular 4. Obj. 4. Frozen section of abdominal tumor. Hæmatoxylin-Suden showing lipoid cells (dark areas) and myxomatous tissue.

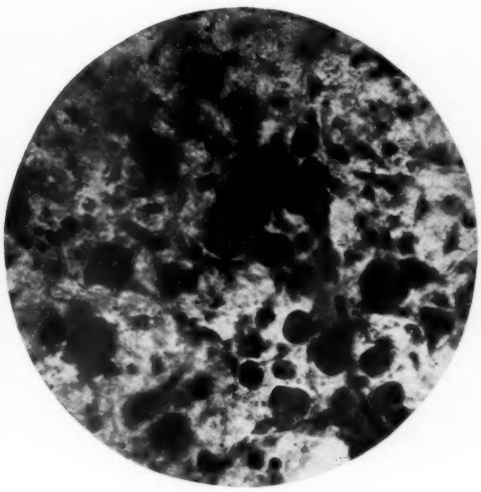


Fig. 9. Ocular 4. Obj. 6. Same section as No. 8.

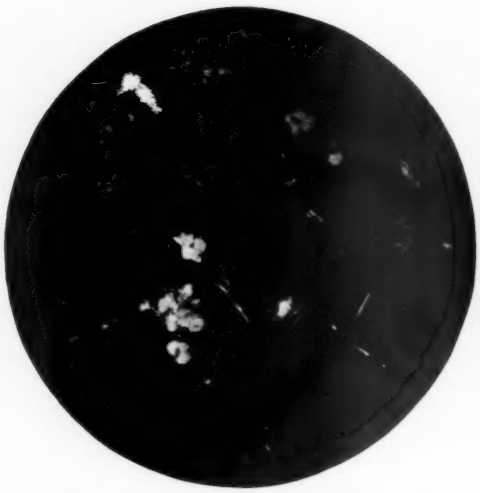


Fig. 10. Double refractive substance extracted with acetone. Polarized light. Crossed Nicolls.

Fig. 11. Frozen section. Suden glycerine. Polarized light. Crossed Nicolls showing intracellular crystals of double refractive substance.

Fig. 12. Ocular 4. Oil immersion $\frac{1}{12}$. Section of tumor removed at operation from mesocolon showing large lipoid cells with honeycomb framework.

Fig. 13. Ocular 4. Obj. 4. Same section as Fig. 12.

seen with here and there a well stained nucleus. In the more cellular areas the blood supply is good through vessels of various sizes. The walls are for the most part formed of spindle cells though in places they are composed of a hyaline fibrillated tissue, showing few nuclei. Various sized hæmorrhagic areas are found throughout the section. Newly formed capillaries are noticed.

Under high power the honeycomb framework of the large cell is well shown.

Tumor in right breast. Section is very cellular, many of the cells containing vacuoles. The nuclei are well preserved.

Tumor in left leg. Section shows necrotic cells. The intercellular substance well developed.

Tumor in left breast. Section shows numerous large cells with deeply staining granular protoplasm. The cells have a rather uniform distribution. The blood-vessels are fairly well developed.

Tumor in left inguinal region. Section is rich in cells, uniformly distributed. A few large cells with deep red granular protoplasm are noted.

The histological findings in this tumor show the well known myxomatous tissue, the embryonal matrix of connective and adipose tissues, and in addition certain lipoid cells, which to us are unique in that they are filled with a lipoid substance differing from that found in ordinary fat cells.

These lipoid cells before maturity show a finely acidophile protoplasm. In a frozen section this protoplasm is infiltrated with a double refractive substance. In a fresh specimen this substance occurs in the form of light yellow drops or irregular masses. With polarized light it shows a double refraction dividing the optic-axis into four equal parts.

When sections of this tumor tissue were stained with Sudan the cellular elements were found to be loaded with a lipoid substance. When treated with osmic acid only a small portion shows the typical primary osmic acid reaction. A few isolated intercellular fat drops did however show it. In a fresh preparation without stain, the greater portion of it gives a smoke gray reaction color with osmic acid. It therefore cannot be a neutral fat substance. A frozen section made from tissue hardened in formalin, when placed in glycerin and examined by polarized light shows double refractive fat drops. A similar refraction is found in tissue hardened for 24 hours in formalin.

After 14 days in formalin the cells are filled with a crystal mass in the form of fine needles or bundles of crystals. Staining with Sudan does not alter the refractive properties, while osmic acid destroys it.

The double refractive substance is soluble in alcohol, ether, and acetone. It is not present in the paraffin sections. Ordinary fat does not give a double refraction. The fat present in this tumor is therefore entirely different from ordinary fat. It is a cholesterin fatty acid ester.[1]

Thus these cells (lipoid) differ both chemically and histologically from ordinary fat cells.

The crystals which form when the tissue has been preserved in formalin for several weeks show the same phenomena. The crystals take the shape of fine needles but on heating become spherical or spheroid.

Since the original investigations of Kayserling and Orgler (1) this double refractive substance, known as protagon or myelin, has attracted considerable notice. It is found in the human body in both physiological and pathological conditions, in extra —and intracellular elements, in epithelium, endothelium, connective tissue. and wandering cells.

A. Schmidt and F. Mueller (2) demonstrated it in the myelin drops found in sputum. Orgler, in the suprarenal capsule. T. H. Panzer (3) in an adenoma of the suprarenal capsule, in fatty degenerated kidneys, in granulation tissue due to staphylococcic infection, and in the mesentery of the intestine.

Pick (4) found it in chronic inflammation of the Fallopian tubes deposited in epithelial-like cells. Also in the plexus choroidalis lateralis which was infiltrated with a peculiar yellowish white substance. Also in cholesteatoma of the lateral ventricle of the brain of the horse.

In examination of over one hundred pus tubes (service of F. F. Simpson, M. D.) in the laboratory of the Allegheny General Hospital the findings of Pick have been confirmed.

Stoerk (5) and Pincus and Pick (6) have found peculiar fat cells containing a double refractive lipoid substance in xanthoma.

This double refractive lipoid substance belongs to the class of protagons which was isolated fifty years ago by Liebreich (7) from brain tissue. It is a complicated substance containing nitrogen and phosphorus. The chemical unity of the substance is not constant, which accounts for the various chemical formulæ found by different investigators.

Panzer (3) isolated from several sources a cholesterin fatty acid ester which was free from nitrogen and phosphorus, but gave a double refraction with polarized light.

On saponification protagon gives lecithin cerebrin, cephalin which by further chemical dissolution produce cholin and fatty acids.

Stoerk (5) believes that the protagon which he

[1] A detailed chemical investigation of this substance will be published later in the Journal of Biological Chemistry.

found in the kidney in certain cases of nephritis is due to degeneration of the protoplasm.[1]

Cholesterin fat in the process of saponification splits up into cholesterin and high fatty acids (palmatinic and oleinic acid).

Histologically cholesterin can be demonstrated in the cholesteatoma found in the choroid plexus, as shown by Pick, it having been split off from the cholesterin fat by vital chemical forces.

On the other hand Aschoff and Adami produced cholesterin fat synthetically from cholesterin and fatty acid.

Opinions are still divided as to whether this double refractive substance (cholesterin fat) is extra- or intracellular in origin.

According to Pincus and Pick (6) there is no doubt that the symptomatic xanthoma seen in diabetes and icterus contain cells which have a specific elective action for collecting cholesterin fat from the blood stream in much the same manner as the thyroid cells collect iodine.

The investigations of Flint in cirrhosis of the liver have shown that in addition to the increase of bile pigments and acids there is also an increase of cholesterin fat.

Pages found in experimental icterus in dogs a marked increase in cholesterin fat from .00928 per cent (normal) to .396 per cent. In all cases of jaundice there exists more or less cholesteræmia.

Klemperer and Umber found in the blood removed from seventeen cases of diabetes, by venesection, an increase of cholesterin fat and lecithin from two to ten times the normal amount.

Cholesterin in the normal blood serum is combined with oleinic and palmatinic acids in the form of an ester as shown by Huerthle. In diabetic blood Klemperer and Umber found a similar combination.

Xanthoma diabeticum and icterum are, according to Pick, the result of the cholesteræmia.

In contradistinction to this infiltration theory of Pick, Orgler claims that the protagon is normally present in the cells and under certain pathological conditions becomes crystallized and visible, but not increased.

Despite the opinions of Orgler and Stoerk it seems more rational to consider it as a lipoid infiltration, various cells both normal (choroid plexus and suprarenal) and pathological (kidney and Fallopian tubes) having the power of collecting this lipoid substance from the body fluids.[2]

1. Virchow's Archiv., 1902.
2. Berliner klin. Wochenschrift, 1898.
3. Zeitschrift für physiolog. Chemie, bd. 48.
4. Berliner klin. Wochenschrift, 1908, No. 37.
5. Sitzungberichte der Kaiserl. Akademie der Wissenschaft in Wien. Mathem. naturwissenschaftl. Klasse, bd. 115, abt. iii, Februar, 1906.
6. Deutsche Med. Wochenschrift, No. 33, 1908.
7. Liebig's Annal., 134, 29.

[1] The decomposition of protein bodies into fat is very problematical. The experiments of Rosenfeld in phosphorus poisoning have shown that the fatty degeneration of the cells is not due to a decomposition of the albuminoid bodies but to an infiltration.

[2] Unfortunately it was not convenient to examine the blood of the patient from whom the tumor here reported was removed, and thus it is impossible to say whether the blood of this patient contained an increased amount of cholesterin fat. It is unlikely, however, that the immense amount of cholesterin was due to some intracellular synthetic, chemical action.

THE TREATMENT OF DIFFUSE SEPTIC PERITONITIS FROM APPENDICITIS IN THE FIRST TWENTY-FOUR HOURS

By RUSSELL S. FOWLER, M. D.
Chief Surgeon, German Hospital; Surgeon, Methodist Episcopal (Seney) Hospital, Brooklyn, New York

Of a series of 167 cases of diffuse septic peritonitis from appendicitis personally operated upon at varying intervals following perforation, up to January 1, 1909, there have been but 15 cases operated upon within 24 hours of the onset.

This series does not include any case operated upon for perforation of the appendix within a few hours of the perforation, in which event one finds an appendix congested to a variable degree, free or slightly adherent, a perforation usually in the distal half with or without the escape of an enterolith, seropurulent fluid, malodorous or not, according to the germ present, moderate in amount and not under tension, a peritoneum which only in the neighborhood of the appendix showed slight change, perhaps hardly any injection of the peritoneal surface. One cannot tell whether such cases would go on to a diffuse septic peritonitis or would localize. Of such cases I have operated over 100 with no deaths.

Statistics: Of the 15 cases of diffuse septic peritonitis, 9 were males, 6 were females; 4 were between the ages of 10 to 15; 6, 15 to 20; 1, 20 to 25; 1, 25 to 30; 2, 30 to 35; 1, 35 to 40; 11 had

had no previous attacks; 3, one previous attack; 1, three previous attacks; 15 were 24 hours in present attack when operated; 15 were operated by an oblique incision; 15 showed free pus under tension when the peritoneum was incised; in 13 the appendix was free, gangrenous, and perforated; in 2, slightly adherent, gangrenous, and perforated; in 14, the appendix was removed in the typical manner and the stump inverted; in 1, the base was ligated; in 7, the peritoneal cavity was flushed with saline, in 3, with peroxide followed by saline, in 5, no irrigation was used; in 15 cases laparotomy sponges were used to keep back the intestines while removing the appendix; in every case these sponges when removed were saturated with a purulent material and fibrinous exudate; in 7 cases a glass tube into the pelvis was used for drainage; in 1 case, a rubber tube; in three cases, wicking or gauze to the site of the appendix; in 2, vaginal drainage; in 2, no drainage; the average duration of operation was 12 minutes; in 15 cases, the elevated head and trunk posture was employed; 13 cases were given fluids immediately upon recovering from anæsthesia; 2 were given nothing by mouth for 24 hours; 8 received saline enemata q. 4 h. for 4 doses; 6, nothing by rectum; 1 Murphy irrigation. Average stay in the hospital, 28 days. All cases recovered.

Several questions naturally arise due to the apparently diversified treatment employed.

1. There can be no question as to the advisability of early operating.

2. There can be no question as to the kind of incision to employ, i. e., small enough to avoid eventration, large enough to deal quickly with the primary focus of infection, and of a character to afford the best possibilities for drainage combined with the least possibility of infection of the layers of the wound.

3. All the cases spouted pus when the peritoneat cavity was opened. If the nick in the peritoneum is small and the tension high, a thin stream may rise for several inches above the level of the abdomen. This pus is thin seropurulent, or thick seropurulent, malodorous or not according to the predominance of the colon bacilli. The intestines so far as seen are reddened and coated here and there with a lymph. The peritoneum is thickened and soggy. Laparotomy sponges wrung out of bichloride of mercury are introduced gently to keep back the intestines and absorb the peritoneal fluid. The intestines are treated as gently as possible.

4. Ligation of the appendix is only practiced when the colon is too infiltrated to allow of typical inversion of the cæcal stump. Typical inversion is preferred because it allows of removal of all appendical tissues, while ligation leaves a certain amount of appendical tissue behind. As I have several times operated for removal of the stump following incomplete operation by other surgeons, and as I do not wish to be treated to the same experience, I excise. Done deftly it adds two minutes to the time of operating. If by reason of the condition of the patient this two minutes is of great value, ligation may be practiced.

5. If upon removal of the laparotomy pads there is still thick seropurulent material, irrigation is done while the wound is being closed. At the same time in case of thick exudate a tube is inserted into the pelvis through the lower angle of the wound. If the laparotomy sponges seem to have soaked up all the pus, or if the pus is thin and the peritoneum seemingly capable of caring for it, no irrigation and no drainage is used. This is largely a matter of experience.

6. If there are necrotic areas they are drained by wicking preferably, as it allows of better drainage than gauze. In such cases the pelvic drain is usually omitted, as necrotic areas early in the case usually mean an attempt at localization.

7. The elevated head and trunk posture is employed because it lessens the normal intraperitoneal wave toward the diaphragm and hence lessens the rapidity of absorption of septic products.

8. Saline is used by rectum to dilute toxins. It is not used if the intraperitoneal fluid is not under great tension, and if that fluid is thin and of a not highly infective character, it being thought best in these cases to cause a rapid absorption by causing the patient to obtain the fluid needed by his tissues by absorption from the peritoneal cavity.

9. Fluids are given by mouth unless for the same reason as above it is desirable to quickly dispose of the peritoneal fluid. These two latter items are matters of judgment founded on experience.

CONCLUSION

Cases of diffuse septic peritonitis from appendicitis operated within 24 hours of the onset of the disease, i. e., before the peritoneum is infiltrated, recover, providing the primary focus is removed quickly without damaging the absorbing power of the peritoneum, irrespective of feeding or enemas, providing the absorbing power of the peritoneum is properly made use of.

APPARATUS FOR PROCTOCLYSIS

By PEREGRINE WROTH, Jr., M. D., Hagerstown, Maryland

Previous to February, 1908, when the apparatus described below was devised by the writer, great difficulty had been encountered at the Union Protestant Infirmary, Baltimore, in the continuous administration of salt solution by rectum. The difficulties were:

1. Proper control of rate at which the fluid was introduced into rectum was apparently impossible when gravity alone was depended upon.

2. Patients almost invariably began to expel large amounts of fluid before the end of 12 hours after administration was begun; this was due either to too rapid or irregular introduction of fluid, or to irritation of rectal tube.

3. Any obstruction to flow was not apt to be discovered for an hour or more, because if the salt solution is given slowly enough to be retained, considerable time must elapse before an appreciable amount runs in.

The apparatus herewith presented consists of:

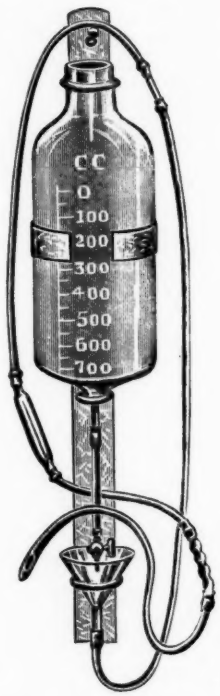
1. A metal frame to hold flask and funnel;
2. An ordinary glass infusion flask graduated in cc.;
3. A stop-cock of some sort with short rubber connecting piece;
4. A small glass funnel;
5. About 8 feet of rubber tubing, interrupted about 3 feet from lower end by glass connecting tube 8 inches in length;
6. A tiny soft rubber catheter (4F) connected to rubber tubing by sharp-pointed nozzle.

This apparatus is hung by bedside, the catheter inserted from three to six inches within the patient's rectum, the flask filled with fluid, and the stop-cock adjusted so that the fluid drops from the flask into the funnel at any rate desired. By the side of the bed, on a table or a chair, two water-bottles filled with water heated to 212 degrees F. are placed, one on top of the other, and the tubing at the point where the glass connecting piece is used is laid between them. By this means the fluid, which is poured into the flask cold, is brought to body heat by the time it reaches the patient. The frame holding the flask and funnel is now raised until the fluid flows through the funnel without backing up.

The management of the apparatus does not require the attention of a special nurse, its use in ward cases, in the hands of the ward nurses, having been proved easy of accomplishment, as practically the only attention required is the filling of the flask and the proper adjustment of the stop-cock.

The use of this apparatus gives the following advantages:

1. Absolute control of rate at which fluid is introduced into the rectum. With the stop-cock we are using, 50 drops per minute allows 6,000 cc. to flow into the rectum in 24 hours. In cases



where absorption was slow, we have reduced the drops to 10 per minute, or 1,200 cc. in 24 hours. Of course, as the fluid in the flask runs low, the drops flow more slowly, and a slight readjustment of the stop-cock is necessary every half hour to keep the rate of flow constant.

2. By means of the graduations on the flask the amount which has flowed in at any given time can be instantly ascertained.

3. The slow and absolutely constant flow of solution does not cause the rectum to become intolerant and result in the solution being expelled,

neither does the presence of the tiny rubber catheter in the rectum cause irritation leading to the same result. The average case has been able to take fluid in this way for at least 3 days without expelling any large amount, without becoming distended or uncomfortable, and usually without being conscious of the presence of the catheter in the rectum. When some of the fluid is expelled, reducing the number of drops per minute, or cutting off the flow entirely for an hour or two has almost invariably enabled the rectum to continue absorbing the fluid. In our experience 5 to 6 litres per day can be absorbed comfortably, and for several days at a time. Patients in the Fowler position retain both solution and catheter without any trouble.

4. Whenever, because of any obstruction, such as a kink in the tube, the presence of fecal matter in the catheter, the weight of a pillow, or the patient's leg resting on the tubing, the fluid is prevented from flowing into the rectum, instantly the fluid begins to back up in the tubing, the funnel begins to fill, and warning is thereby given, enabling one to correct the trouble before valuable time is lost.

With this apparatus coffee, first carefully filtered through filter paper, and peptonized milk, have been successfully administered for hours at a time.

The whole device can be made at such small expense that a number can be kept in a hospital ready for instant use.

Owing to the small size of the apparatus and its compact form the whole outfit can easily be carried in a small handbag when it is to be used in private practice.

In the apparatus described by Dr. Murphy of Chicago (Journal A. M. A., April 17, 1909,) a large hard rubber rectal tip is used. This tip has many perforations to allow a back-flow of salt when the patient strains. Personally, I have never seen this tip used, but I have used the ordinary soft rubber rectal tube, and the discomfort caused by that drove me to change over to the smallest catheter I could find; it would seem to me that a hard rubber tip of large size would cause even more discomfort. As to the ease with which the salt solution may flow back during straining, occasionally the funnel of my apparatus becomes partly filled up by the return of salt solution after it has once entered the rectum; but as a rule the absorption of the solution keeps pace with its introduction and there is none to flow back, even should the patient strain. As a matter of fact there is rarely any straining noticed, — the solution is introduced only as rapidly as the patient can absorb it, the bowel therefore is never distended, and as there is no hard object within the anus causing discomfort, a patient has no more cause or inclination to strain than if proctoclysis were not in progress. However, this apparatus is so constructed that there is no constriction whatever in the tube conducting the solution from the funnel to the rectum; the stop-cock determines the rate of flow of the solution from the reservoir into the open funnel and from that point the fluid runs freely through an open tube which permits it to back up into the funnel if there should be any straining.

The heating apparatus of Dr. Elbrecht described by Dr. Murphy in the article referred to is a refinement on the hot water bag I have been using, but it embodies the same principle of heating the solution only just before it enters the rectum, and there is no reason why it should not be used on the apparatus I have described.

Lately in place of the ordinary stop-cock to control the rate of flow I have been using a cock containing a needle-point valve, which admits of much easier and more accurate regulation.

COMPLETE DIVISION OF COMMON DUCT AT JUNCTION WITH HEPATIC AND CYSTIC DUCTS. SUTURE AND COMPLETE REPAIR OF INJURY

By I. S. STONE, M. D., Washington, D. C.

Mrs. J., aged 36, entered Columbia Hospital in December, 1907. She had been sent by Dr. Batson of Montgomery County, Md., with the suggestion that she had appendicitis. Her illness had not been attended by the passage of gall-stones, or jaundice, although her color was sallow and a trace of bile was found in her urine. A mass was easily located at and a little above the McBurney point, which resembled in some respects an appendiceal abscess, although apparently more superficially located. She had no diarrhœa or other intestinal complications, but had fever of moderate degree and an increased leucocytosis which indicated acute intra-abdominal mischief. We were not surprised to find a prolapsed liver and a very large gall-bladder containing several stones, one of which was trying to make an exit into the common duct. The gall-bladder was firmly adherent to the abdominal wall and ascending colon, and a perforation existed between the two, through which it is possible that one or more stones had passed. The gall-bladder was separated from its lower attachments and unexpectedly separated from the common duct as we endeavored to secure it by a clamp. Just here we made the interesting discovery that a stone had long been located at this point and had caused a necrosis which permitted the easy separation of the gall-bladder along with the cystic duct and left a complete separation of the hepatic and common ducts. The entire removal of the gall-bladder was easily effected, but the restoration of the ducts which were divided, constituted a new and interesting proposition. We first made careful soundings to insure the patency of both hepatic and common ducts, and finding that the downward traction caused by the very low attachment of the gall-bladder had somewhat elongated and paralleled the hepatic and common ducts, we sutured the posterior margins firmly together with catgut and placed stay sutures about the severed ends of both ducts which held them nearly in apposition, yet without closing their lumen. Drainage was placed appropriately and everything proceeded with satisfactory results until a cure was effected. Bile discharged for about ten days, then it ceased and the patient left the hospital in good shape in three weeks, doubtless stimulated by the desire common to all Christians to get home by Christmas.

Direct suture of the bile ducts without the aid of any device such as Halsted's "hammer," has rarely been reported. The upper portion of the common duct which is quite easily reached in most subjects, can be reunited if divided by accident or otherwise.

The case reported by Kehr is somewhat similar to my own. (Muench. Med. Woch., March, 1905, No. 23, 52, 1, p. 1097.) He used silk sutures to make an end to end anastomosis and brought the ends of the sutures out of the abdominal wound.

Moynihan (Abdom. Operations, p. 576) mentions Doyen's case, also similar to mine, although he had purposely excised a portion of the duct for stricture. These operations have been readily performed, owing to the accessibility of the upper end of the common duct, and in my case at least because the closure was made without excessive traction upon the line of suture.

TRANSACTIONS OF SOCIETIES

CHICAGO SURGICAL SOCIETY

A REGULAR MEETING WAS HELD JUNE 18, 1909, WITH THE PRESIDENT, DR. A. E. HALSTEAD, IN THE CHAIR

Dr. W. H. Allport read a paper entitled "Tuberculous Infections of the Peritoneum."

DISCUSSION

DR. L. L. MCARTHUR: Mr. President: It would appear that after all the researches that have been made, all the writing that has been done on this subject, we should be more unanimous in our opinion as to the treatment of tuberculous peritonitis in its varied manifestations than we are. I do believe, however, since Fenger's memorable article that greater unanimity has obtained and that the majority of the surgical profession are convinced that aid is given by the operative treatment of the cases selected after the propositions submitted by Dr. Fenger.

One who has had such a vivid personal experience as I have in the case of my own daughter, can realize perhaps better than anyone else what an enormous influence is exerted, however it acts, by opening the abdomen. I had a daughter suffering with a tubercular (mild) appendix, so mild that my colleagues advised non-operative intervention, later producing a hypertrophic condition at the ileocecal region which became so obstructive as to demand operative intervention. Dr. Bevan very kindly opened the abdomen of the child for me and found the most typical picture of general abdominal tuberculosis that one can ever see. The peritoneum was studded with miliary bodies; the omentum was thickened into a pancake with indurated masses; the ileum was distended from the obstructive condition obtaining at the ileocecal junction from the tuberculosis of the hypertrophic type, and so extremely involved were all the tissues within the abdomen that it was deemed advisable to simply close the abdomen and not even make an anastomosis to relieve the obstruction. Following the opening of the abdomen, a change of climate, the use of the X-ray, absolute rest, in the course of nine months the peritoneum, when again opened, because obstruction was total, had so changed that no signs of tuberculosis could be seen in the peritoneum. It was absolutely normal and smooth. The omentum had again assumed its normal condition, and there existed simply a dilated ileum, which was so totally obstructed that it had to be anastomosed with the sigmoid to relieve the obstruction which had obtained, for the succeeding nine months after the first operation, to the extent of excessive emaciation and total obstruction. These changes, then, that can occur after opening the abdomen and the use of the X-ray and change of climate are absolute, showing that the peritoneum can again become normal.

In the order of operation I have had this experience: A case of general tuberculosis associated with ascites that had twice been taken to the operating room for operation, the patient's condition being so desperate that Dr. Fenger said, "No, we will take her back; we won't operate." Feeling that the patient would die if something was not done, I opened the abdomen, and that patient made a prompt and quick recovery, although the long experience of Dr. Fenger absolutely warned against it. We cannot judge by the severity of the case or the alarming condition of the case as to the desirability of operating or not. Some other basis must be made.

The mentioning of the dissecting out of a localized cyst by Dr. Allport recalls the fact that in the various pockets of the peritoneum these ascitic collections of fluid may occur, and particularly recalls a case which occurred during the past winter, first in the service of the writer of the paper, who, opening the inguinal canal for what was considered a possible hernia, found a hydrocele of the canal of Nuck. This hydrocele was dissected out and following it came a fæcal fistula. The case with fæcal fistula then came into my service on the termination of Dr. Allport's service, and proved on operative intervention to be tuberculosis of the bowel close to the internal ring. The general peritoneum was studded with miliary tubercles; the intestines and pelvis matted together. The tuberculosis had spread from the genitalia and had involved the peritoneum which

lined the inguinal canal, which had remained patulous probably in this case. This case failed, as do most tubercular cases, to be cured by trimming the edges of the tubecular ulcer of the bowel and suturing. The fæcal fistula persisted until in desperation we tried the vaccine of Wright. Within ten days the discharge began to diminish, the tubercular fistula healed, and now the patient is fat, well, out and around again, without any further local interference on account of the tubercular fistula.

You are familiar with the reference made by our laboratory in regard to the possible differentiation between the forms of tuberculosis which occur in the peritoneum by means of Wright's opsonic index, for I am convinced that far more frequently the bovine organism produces the hypertrophies and the human organism the ulcerative and caseating processes which we here meet with, and it is perfectly possible with a perfectly normal opsonic index in the case of tubercular peritonitis to obtain a bovine opsonic index of less than half the norm, and by treatment by the bovine vaccine to improve the patient, although the opsonic index was not raised commensurately over the rise which was observed when the tubercular human vaccine was given. Pathologists now are prone to claim that the character of the miliary body itself when seen is different when made by the bovine organism from that made by the human tubercle bacillus. The bovine organism does not make the fine, pearly miliary body we have been taught to regard as the characteristic miliary body, but makes a body far more elevated, almost papillomatous in character, and I think makes these hypertrophic stenoses which in the past have so frequently been called carcinoma of the colon. In a tubercular fistula which began after a tubercular appendix, and which resisted all treatment, I have in one case, with a single injection of Beck's paste been enabled to effect a cure.

Dr. Arthur Dean Bevan: This is a subject in which we have all had a good deal of experience and about which we may possibly have some differences of opinion. I should like to express my opinion of the interpretation of the enormous mass of evidence that we at present have on the subject of tuberculous peritonitis, and I can do this very briefly, especially from the standpoint of the value of the exploratory operation *per se*. I think the evidence on that point points to the conclusion that tuberculous peritonitis is a lesion which has a very strong tendency toward cure, more so than tuberculosis of the lung or joint, or certainly as much so as of the joint, and more so than tuberculosis of the lung under ordinary circumstances. Second, that an exploratory laparotomy is of very little service or value *per se*, but it is, however, of enormous service in that it enables one to make a definite diagnosis. I should say that ninety-five per cent of the value of an exploratory laparotomy in cases of tubercular peritonitis lies in the question of determining the diagnosis. Now, of what possible value is an exploratory laparotomy if, in the cases where you make it, you find no free fluid, but an obliterated peritoneal cavity? Where you do not practically open any of the peritoneal cavity? Where you close the case? In these cases you have not allowed light or air to get in; you have not produced any considerable hyperæmia over any extent of the peritoneum, but you remove a little section of the tissue for microscopic examination or else from gross appearances conclude that the patient has or has not tuberculosis, and if the patient has tuberculosis you can give him the benefit of the general hygienic treatment of tuberculosis. You put the patient to rest; you put him in tent life, and have him sleep out-of-doors; you feed the patient; you give him every possible benefit of the hygienic treatment for tuberculosis, and on a definite diagnosis, and as a result a large proportion of these patients go on and recover. I do not believe that an exploratory laparotomy *per se*, if we could put the matter down in figures, would be found to have more than five per cent of value, whereas the making of the diagnosis has ninety-five per cent of value in an exploratory laparotomy. I think Fenger was quite right in his conclusion that an exploratory operation *per se* was of little value. We have had this experience within a comparatively short time of doing a laparotomy on a case in the hands of an expert diagnostician, with a diagnosis of tuberculous peritontis, the patient being a boy, fourteen or fifteen, finding free fluid having the gross typical picture of tuberculosis of the peritoneum, the peritoneum being studded with miliary tubercles, removing a little section of the peritoneum and finding carcinoma. I had the experience recently of opening a case which was clinically one of tuberculous peritonitis with a large amount of fluid, finding papilloma of the ovary with implantation. We have had, too, the experience and have made the diagnosis of tuberculous peritonitis in a case that had been tapped repeatedly, made an exploratory laparotomy, and found a very thin-walled flaccid ovarian cyst, which I would defy anyone to have differentiated physically, from a case of tuberculous peritonitis. The conclusion is to my mind very definite that the weight of evidence in these cases is in favor of an exploratory laparotomy and really an exploration is demanded

in these suspected cases, that is, exploration, the removal of a small section of tissue, and absolute determination of the diagnosis, and after that is made, giving the patient the benefit of the hygienic cure for tuberculosis. Here is a parallel: How many cases of actinomycosis of the abdomen go on unrecognized for the want of proper investigation? Many of them go on to their death. Wherever a definite diagnosis is made, a large majority of them can be cured by iodide of potash and copper and general hygienic treatment. The same is true of tuberculous peritonitis. If a definite diagnosis is made, proper treatment, i. e., hygienic treatment, is worth much more than the specific treatment of copper and iodide of potash for actinomycosis, and will accomplish greater good in the majority of cases of tuberculosis of the peritoneum.

DR. ALEXANDER HUGH FERGUSON: My first experience with tuberculous peritonitis goes to prove the value of an abdominal incision. This experience occurred twenty years ago (1889), in the case of an Icelandic girl, with an enormously enlarged liver, and the abdomen full of fluid. The diagnosis made was that of hydatid of the liver with obstruction of the portal circulation (a very rare condition). I opened the abdomen, found the surface of the liver studded with tubercles as well as the general peritoneum, and the abdomen full of ascitic fluid. There was no hydatid cyst. I simply closed the abdomen as I did not know what else to do. I did not mop out anything, and the girl recovered. She got married, and has borne six children since then; they are all healthy. I saw her last February.

The next case was also an Icelandic girl, with hydatid of the liver, and tuberculous peritonitis. I opened the abdomen and emptied out the hydatids. She improved for a short time; the abdomen refilled. The lymphatic glands became generally enlarged throughout the entire body, in the neck and groin, and she died finally with invasion of the lungs, so that the opening of the abdomen in that case apparently had no benefit whatever.

Miss T., of Rockford, had evidently tuberculous peritonitis originating in the tubes. She was operated upon by Dr. Binkley, who removed the right tube. I opened her abdomen and found tuberculous salpingitis on the left side which also involved the uterus. I removed the uterus with the right tube, also the appendix, and she had a fæcal fistula which finally closed. Following upon that was obstruction of the bowels, with great distention and marked emaciation. She had been to California and came back for an operation. I opened her abdomen, removed nine inches of the sigmoid, and two and a half feet of the small bowel. She has made a recovery, has gained over fifty pounds, and is doing the household work of her mother.

Another case (Dr. Gentle's case) of tuberculous peritonitis followed rapidly after childbirth, there being lung involvement before then, which improved, but after childbirth the abdomen became enormously enlarged and œdematous. I opened the abdomen and found an enormously thickened and succulent peritoneum. I should say it was at least two inches thick, gelatiniform in character. We resorted to the use of iodoform emulsion (10 per cent), made openings in two or three other places for its insertion, but did no good. She went on and died.

There were a number of other cases of a milder nature in which we removed a tube or appendix which was involved in the tubercular process, and the patients got well. Lateral anastomosis would not have been of any benefit in the case of Miss Taylor because the pathology was so extensive. I would favor, however, lateral anastomosis in those cases where the pathology was more or less limited, and where you cannot dig out such a large mass, particularly in young children. I have had two cases of tuberculous fistula communicating with the peritoneum in which I used Beck's paste, and the fistulæ closed promptly.

DR. CARL BECK: Mr. Chairman: I wish to say a few words with regard to the treatment of tubercular fistulæ of stercoral character. We have had a number of experiences in this line of late, particularly two cases which may interest you. One of them was a case of a fistula resulting from an operation in the usual manner with opening of the peritoneal cavity and subsequent drainage with gauze. Shortly after removal of the gauze a stercoral fistula developed and the man was sent to us for treatment with bismuth paste. He improved only slightly. The bismuth injections showed that there was a small external fistula with a bottle shaped cavity underneath communicating with the bowel, close to the duodenum. The man lost much in weight owing to this anatomical relation and died about a month after he came to us for treatment. The post-mortem showed above mentioned relations, and it was clear from the post-mortem that pressure from the gauze drain had injured the bowel to such an extent that the wall had ruptured. Had this bowel been stitched up to the abdominal wall, as we did in another case subsequent to this, the result would have been a direct fistula, which, as in the latter case, healed promptly under the bismuth paste

treatment, as did the case which Dr. McArthur has related.

Dr. D. A. K. Steele: My experience with regard to tuberculous infection of the peritoneum has been practically the same as that of those who have spoken. The plan I have always followed in cases I believe to be tuberculous peritonitis has been to make an incision for diagnostic purposes, and remove some tissue for laboratory examination and diagnosis, usually following the old idea of letting in some sunshine or light, manipulating the parts with iodoform gauze, and closing with drainage. A number of patients have made gratifying recoveries following that line of treatment. In some forms of tubercular peritonitis operation seems to do no good, as, for instance, in those cases where the intestines are matted together, and where there may be several tubercular foci. In these cases it would seem that operation is useless, and yet some of these patients live. I think I should follow the suggestion of Dr. Bevan, namely, to make an exploratory operation for diagnosis, and often the making of the diagnosis by such an operation results in the cure of the patient.

Dr. Jacob Frank: I would like to ask if any of the members have had any experience with the tuberculin vaccination test, especially in the diagnosis of tubercular peritonitis.

Dr. D. W. Graham: I want to say a word in favor of drainage, as everybody seems to have condemned it who has spoken of it. If, on opening the abdomen distended with fluid, we make a diagnosis of tuberculous peritonitis, and close the wound without drainage, we will have in a short time as much distention as we had before. I have drained a number of these cases, and I have never had a death from drainage, nor have I ever had a fæcal fistula as the result of drainage, and I shall continue to drain in some of them. A good deal depends on the method of drainage. If you pack the abdominal cavity full of medicated gauze or any other kind of gauze, you will do damage. If you put in a glass drainage tube you will be likely to cause necrosis of the bowel. If you put in a long, hard rubber drainage tube, you will get necrosis, if you keep it in long. But if you will use a small, soft, short, rubber drainage tube, it will do no damage, and will prevent the immediate reaccumulation of ascitic fluid.

I recall at least two cases I have had that got well from simple tapping, tapping repeatedly over several months. The diagnosis, it is true, was a clinical one, but it was not doubtful in my own mind, and both recovered after several months.

Since this is largely an experience meeting, I may refer to a case I had some twenty years ago or more,— a boy, five or six years old, upon whom I was called to operate for appendicitis. There was a history of abdominal trouble existing for some time. There was a mass in the region of the appendix. I found the appendix normal, but the cæcum was greatly thickened and covered with sessile nodules, many of them being more than an inch in diameter. I diagnosed malignant disease, sewed up the wound, and gave an unfavorable prognosis. Of course, in those days we did not know as much about the hypertrophic type of tuberculous deposit as we do to-day; but that boy got well.

Dr. Allport (closing discussion): The mysterious things in connection with tuberculous peritonitis were not all mentioned in the paper. Perhaps the most mysterious thing of all is the fact that writers on this subject seem, no matter what their views may be, to be able to secure statistical data confirming their individual opinion. Dr. Graham seems to take the position that many cases recover after simple tapping. This is exactly the view which was taken by Borchgrevinck in his paper of 1900. This writer claimed that so many of his cases recovered after simple tapping that he was quite well satisfied with that method as a means of cure. All other writers, on the contrary, hold to the view that tapping is absolutely inadequate — that it is necessary to actually open the abdomen, expose the peritoneum, and evacuate all the fluid, in order to secure even those very moderate results which are claimed by conservative surgeons.

In this connection it is interesting to note that Borchgrevinck's paper of 1900 was largely quoted from in the paper which Dr. Fenger read before this society in 1901, and which led to the notion that Dr. Fenger himself was radically opposed to exploratory incision and evacuation in tubercular peritonitis. Dr. Fenger's paper was rather characteristic of the man, and may be read with interest by those who care to puzzle themselves discovering the views which he actually held. It will be remembered by those who ever heard him speak, that his mind was a very open one, that he quoted authorities upon both sides, often talked on both sides, and in the end the listener often could not make out very plainly which side he actually favored. His paper of 1901 was an eminently catholic one and fraught with this peculiarly judicial quality of mind. He went over the literature thoroughly, quoting each writer in turn impartially, often neglecting to use quotation marks in his printed paper, where not only the matter but the wording was obviously not claimed as his

own. After discussing the views of Czerny, Bottomley, and several others approvingly, especially as to the operative treatment, and giving their statistics, he proceeded to a discussion of the other side of the question, referring especially with approval to the scientific aspect of Borchgrevinck's article. Anybody reading extracts from Dr. Fenger's paper, without the context, would suppose that his views were identical with those of Czerny and Bottomley, but reading a little farther along, would be equally convinced that he held, without qualification, to the views of Borchgrevinck. It was evidently this latter portion of the paper which led Professor Monro, in Keen's System of Surgery, to attribute to Dr. Fenger those reactionary views which were actually held by Borchgrevinck. If Dr. Fenger had investigated the method by which Borchgrevinck secured his statistics he would probably have been the first to concede that deductions made from such data were of absolutely no value. Thus, the latter states that almost all cases of simple peritonitis are demonstrably tubercular. None of us, I think, would take such a comprehensive view of tubercular peritonitis, since the statistical result of such a view led Borchgrevinck to report that 82 per cent of his cases recovered without operation. This percentage is hardly less than preposterous — 80 per cent of patients with tubercular peritonitis do not recover under any method of treatment, and not even the most ardent advocates of operative interference claim the 60 per cent of recoveries after operation which are conceded by Borchgrevinck. This writer in his article still speaks kindly of treatment by repeated tappings, and cannot — with Dr. Graham — see why these are not as good as open incision. They fail to realize that when the abdomen is sponged until absolutely dry, there occurs not only a very radical collapse and coaptation of the folds of the peritoneal sac, but also a change in the intra-abdominal tension. This, in turn, results in certain very necessary but usually temporary adhesions around diseased areas. The basis of Borchgrevinck's statistics being that all cases of ascites which could not be identified as due to some other cause, were due to tuberculosis, and such cases being, as will be conceded, often curable, by repeated tappings, their recovery only added to his favorable percentage and to his absolute therapeutic views. It would appear that an incision is absolutely essential, since it secures complete evacuation, exposure of the tubercular surface to light and air, acute peritoneal hyperæmia, complete collapse of the peritoneal sac, and temporary adhesions walling off diseased areas.

There seems to be an agreement on the question of drainage; the more these cases are drained, the more disastrous do they prove. No matter by what method we drain, such drainage is apt to be followed by continued fistula, if not by fæcal fistula; in the large percentage of cases this spells death. All of my fæcal fistulas were in drained cases, and of the three cases which died all were drained. I believe if, at least, one of these incisions had been closed in the immediate manner recommended by Murphy[1] she would have recovered. Dr. Murphy advises that local peritoneal abscesses of a tuberculous character, lying, or for example in the omentum, along the bowel, or in the pelvis, should be sponged out gently, getting rid of as much of the loose material as possible, dusted with a little iodoform, and, after allowing the abdomen to collapse, closed immediately. Should secondary abscesses form he advises that there should be no incision, but that the abdomen should then be tapped by trocar or syringe, through which finally an emulsion of iodoform, glycerine, and formalin is to be used. This method seems wise in many cases, but it must be confessed that my own mind does not exactly grasp the possibility of closing and healing such an abscess cavity in this way every time.

In the matter of climate as an adjuvant to a cure, I would again urge that the best results I have had were in those to which were added to surgical intervention, such important therapeutic agents as climate, diet, and hygiene,—and of these, climate is the most important. Just why it is that patients with local peritoneal tuberculosis do better in the mountains is a mystery, but those cases which were described in my paper as Nos. 3, 5, and 7 bear especial witness to the efficacy of this agent.

Dr. Frank has asked as to the use of the Pirquet or Calmette test in tuberculous peritoneal infections. I have had no experience with the Calmette test, but used the Pirquet test in three cases; and in them I found the results satisfactory. Two points in connection with this test are worthy of consideration: first, it is a better test to use in children than in adults. In the former a reaction can almost invariably be secured, if the technique is correct, and if the case is actually tubercular. Secondly, there seems to be a better reaction where there is no temperature. Probably this is because where there is temperature the resistance is high; hence the invasion of the skin adjacent to, and underlying the point of inoculation, is not as well defined as in those cases where a lack of temperature shows a quiet system with no apparent resistance.

[1] American Journal of Obstetrics, vol. 49.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF SURGERY

UNDER THE CHARGE OF

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So-called Idiopathic Dilatation of the Œsophagus
(Les dilatations dites Idiopathiques de l'œsophage). BENSAUDE ET RIVET. *Archives Générales de Chirurgie*, April, 1909.

By primary idiopathic dilatation of the œsophagus, we understand a dilatation not due to any mechanical obstacle, nor to any organic lesion of the parietes of the organ, nor to compression of the organ by a neighboring tumor. From the etiological standpoint, these dilatations begin between the ages of twenty and forty years and occur with about equal frequency in men and women. The disease may manifest itself after a traumatism, after some psychical crisis, may occur during pregnancy. These provocative cases are important only from the fact that they act upon the neuropathic constitution, and nearly all the authors look upon hysteria as an etiological factor. Anatomically these dilatations are not voluminous; they are fusiform or pyroform and seated above or below the diaphragm. The capacity of the dilated œsophagus varies from 170 to 1,500 cubic centimeters. All the layers of the œsophageal wall may be altered. The mucosa presents chronic inflammatory lesions, at times erosion or ulcerations more or less deep The muscularis is irregularly hypertrophied. The cardia is often contracted and shows no anatomical lesion; there may be periœsophagitis.

As to the theories of this condition (1) Meltzer and Mickulicz have claimed that idiopathic dilatations can be due to a spasm of the cardia. In favor of their theory, they quote the experiments and observations made at the autopsy table and during the course of a laparotomy. This spasm of the cardia may be primary or secondary to an œsophageal lesion, to an ulcer of the cardia. (2) Then there is the theory of œsophageal atony. This theory is based upon the results of œsophageal sounding and findings observed during œsophagoscopy. Atony is the cause of œsophageal dilatations and the cardiospasm is but a secondary phenomenon. (3) There is a third theory: that is, that the dilatation is due to a lesion of the pneumogastric. In this case the cardiospasm and the atony would be conjoined phenomena due to a lesion of the pneumogastric. This nerve possesses a double action, one upon the tonus of the œsophagus and one upon the closing of the cardia. This theory is based upon the experiments of Cl. Bernard, Schiff, Chauveau, and a personal case in which an atrophy of both vagi was existent.

The symptomatology is quite variable. The affection may remain latent for a long period and then gradually or suddenly determine œsophageal or gastric disturbances. Symptoms of dysphagia, similar to those found in œsophageal stenosis are present, but their character is that they are intermittent and are accompanied with painful colicky pains in the epigastrium. At a later period, then, we have œsophageal vomiting. This at first is immediate, but becomes late with the increase of the œsophageal distention. In the intervals, the patients have crises of dyspnœa, intrascapular pains due to distention of the duct. Among the accessory symptoms are rumination, fetid breath, œsophageal pain, and increased secretion of saliva, etc.

The general state in time becomes affected and the patient gradually becomes cachectic. There are prolonged intervals of absence of symptoms. Death occurs in the midst of toxic or infective phenomena. In four cases of sudden death, it seemed that the fatal ending was due to inhibition.

In œsophageal dilatations, if the pouch be large and distended, percussion elicits a dull note which disappears after emptying of the pouch. On auscultation, one notices a suppression, a retardation, or modification of the second deglutition sound. Exploratory sounding shows contracture of the cardia. The evacuating tube removes food debris not very much modified but surrounded by a quantity of mucus. No free hydrochloric acid is found. After the injection of bismuth, the examination is supplemented by radiograph, by œsophogoscopy, which enables one to determine the state of the cardia and nature of the obstacle.

The differential diagnosis calls for the exclusion of pyloric stenosis, bilocular stomach, different forms of compression of the œsophagus, dilatation secondary to organic parietal lesions, cancer, cicatricial stricture, hysterical spasm of the œsophagus, and diverticuli.

The prognosis is bad. The patients usually die of inanition, but may live a long period.

The aim of the treatment should be to make alimentation possible. The authors have advised lavage of the œsophagus, dilatation of the cardia by conical bougies employed under the control of the œsophagoscope and high frequency currents against the cardio-spasm. If these means fail, a gastrostomy is indicated, and by the gastric mouth one can attempt the dilatation of the cardia by prolonged sounding. AIMÉ PAUL HEINECK.

Colloid Glands (Goiters): Their Etiology and Physiological Significance. DAVID MARINE, M. D., AND C. H. LENHART, M. D. *The Johns Hopkins Hospital Bulletin*, vol. xx, No. 218.

The authors base their results and conclusions on a long series of experimental work in which they have used the thyroids of a large number of dogs and sheep.

In the observations recorded the following points were brought out:

1. Colloid glands are in all their anatomical characteristics the nearest approach to normal glands that active hyperplasias can become.

2. There are as many degrees and sizes of colloid glands as there are degrees and sizes of actively hyperplastic glands.

3. There are all gradations from colloid glands to active hyperplasias.

4. The iodin contents of colloid glands are the nearest approach to those of normal glands that it is possible for glands to attain to, which have once been the seats of active hyperplasia.

5. Spontaneously occurring colloid glands are most frequently found in well nourished and middle aged animals.

6. Colloid glands are known to occur from spontaneous reversion of hyperplasia or following administration of iodin containing substances to animals with hyperplasia, and in either case the resulting condition (colloid) is histologically the same.

7. Partial removal of colloid glands is followed by the compensatory hyperplasias as occurs in normal glands following their partial removal.

8. The administration of iodin containing substances will prevent the occurrence of secondary hyperplasia in colloid glands to the same extent that it prevents the occurrence of hyperplasia in normal glands following their partial removal.

9. It is possible by means of partial removals together with withholding and giving iodin, to follow the process of reversion to a colloid gland; the process of compensatory hyperplasia, and the second process of secondary reversion, in the same dog.

The authors believe that the anatomical, chemical, and biological data incorporated in their report are sufficient to justify the conclusion that in dogs and sheep, at least, all pure colloid glands are reversions from degrees of active hyperplasias, and are the nearest approach to the normal quiescent condition that glands can ever assume which have once undergone hyperplasia.

The process of reversion being physiological rather than pathological, it seems to the writers to be more closely allied with the involution type of atropy than with degeneration. ARTHUR B. EUSTACE.

Total Cystectomy for Pediculated Tumors of the Urinary Bladder (Cystectomi totale pour tumeurs pédiculées de la vessie). MARION. *Revue de Gynécologie et de Chirurgie Abdominale*, No. 2, 1909.

The patient, a female, has had for the last two years an hæmaturia which lately became very abundant. Upon vaginal examination, immediately behind the pubis can be felt an orange-sized mass. The cystoscopic examination led to the diagnosis of tumor of the bladder. Suprapubic cystotomy was performed, and the operator found the bladder filled with pediculated tumors. He attempted their extirpation. He was obliged to stop owing to the abundance of the hæmorrhage. He closed the bladder, made a total cystectomy and implanted both ureters in the abdominal wall. At the end of fifteen days, he thought of implanting the ureters into the intestines, but he had to give it up owing to the presence of symptoms of ureteritis. Two months later he did a double nephrotomy for a double pyonephrosis. The operation had been too long delayed. The patient died. The removed bladder showed 40 pediculated tumors varying in volume from a pea to a walnut. Microscopical examination showed that these tumors were epitheliomatous in nature.

Some of the surgeons present at the meeting were of the opinion that it would have been better to implant the ureter immediately into the intestine. It is thought that the ascending infection of the ureter is less liable to occur if in dissecting the uretero-vesical orifice a collarette of vesical tissue is removed. This collarette of tissue is sutured to the intestine.

For Delbet uretero-colostomy is an operation of last resort. The danger of an ascending infection is ever present.

M. Guinard said that eight years ago he implanted the ureters into the colon and that his patient is still in good health. M. Chaput also has a patient in whom he implanted the ureters in the colon six years ago. The patient is still in good health.

AIMÉ PAUL HEINECK.

Non-operative Cure of Hernia (Contribución al estudio de las hernias que padecen los reclutas para fallar su inutilidad temporal ó total). DR. ANTONIO SOLDUGA. *Revista de Medicina y Cirujía*, May, 1909.

The author is an examining surgeon in the conscription service of the Spanish army, in which capacity he has abundant opportunity to see this class of cases. Unlike the civilian surgeon, who operates all possible cases and rarely sees again those for whom he prescribes trusses, the author has exceptional advantages for the study of the cases on which trusses are used, as he operates none of them, but orders trusses, the patient returning for re-examinations extending over a period of three years before he is definitely exempted from military service.

The author here reports a series of 1,100 cases which came to him first during the year 1905, and which

he has followed for three years since. These were divided as follows: 1,036 inguinal hernias, almost all oblique and the majority congenital; 55 femoral; 4 supraumbilical through linea alba; 3 post-operative; 1 umbilical; 1 through Petit's triangle.

The cases which he finds incapable of non-operative cure are the following:

1. Those which are irreducible in whole or in part, either because they are too voluminous to be returned to the abdomen, or because of adhesions, or because they are associated with neoplastic growths like lipomata or with excessively large epiploic appendices.

2. Those accompanied by ectopia testis; these are expecially apt to be interstitial.

3. Those associated with shortening of the canal, due to the yielding of the wall internal to the internal ring and the consequent lessening of the obliquity of the passage.

4. Direct hernias of all kinds, whether inguinal, femoral, or otherwise.

Of the 1,100 cases reported, the author found apparently perfect cure by truss within 3 years in 4 per cent of all those not included in above, that is, in 4 per cent of all small and easily reducible oblique inguinal hernias, all of the patients being between the ages of 20 and 24.

The truss, in order to be of benefit, must compress the whole canal, closing the internal as well as the external ring; this pressure, opposing the intra-abdominal pressure, causes a certain amount of irritation and leads, in the author's opinion, to a strengthening and thickening of the peritoneum in the canal, and in rare cases causes a mild adhesive peritonitis, with total occlusion and cure. In direct hernias, on the other hand, no such counter-pressure is possible, the intra-abdominal pressure forcing the hernial mass out as a wedge, and tending to open the tract wider; the same applies to those oblique hernias in which there is shortening of the canal.

B. J. O'Neill, Jr.

Pulmonary Emboli After Operations for the Radical Cure of Inguinal Hernia (Embolies pulmonaires après la cure radicale des hernies inguinales). Mauclaire. *Revue de Gynecologie et de Chirurgie Abdominale*, No. 2, 1909.

Mauclaire's patient was a male, forty-two years old and quite fleshy. He was operated on the second of May, 1907, for a right inguinal hernia. There were no operative incidents. A few days after a bilateral swelling of the spermatic appeared. There was pain, but no fever. There was no local reaction, no signs of phlebitis of the inferior extremities. On the 18th of May, 16 days after the operation, 12 days after the appearance of the funicular swelling, the patient experienced, without an appreciable cause, a sharp pain in the side; pallor, cold extremities and a tendency to syncope were present. Hypodermic injections of ether were given. The patient somewhat improved. The pain persisted, however, and was soon accompanied with cough and a blood stained sputum. On auscultation, posteriorly, just below the inferior angle of the scapula, an area of subcrepitant râles could be detected. There was no fever. This state persisted during a few days, and was followed by a progressive improvement. The patient has since remained well. During his stay in bed, his temperature was always normal.

Embolism, following hernia operations is not a common occurrence. Coley only noticed it once in a thousand operations for inguinal hernia; Stori observed it eight times in 3,000 hernia operations. Gardini noticed it five times in 2,000 cases. Mauclaire has been able to collect 50 cases only three of which occurred in France. The case which he reports is the only one which he has seen in 500 operations for inguinal hernia performed during the last ten years.

This complication is most frequently seen in left-sided hernias. Ninety per cent of the cases of post-operative phlebitis are on the left side, and this is explained by the fact that the course of the left iliac vein is more oblique than that of the right, that the blood circulates in it slowly, and also that the compression which the fœcal mass in the sigmoid flexure exerts upon the iliac vein, predisposes to thrombosis.

Some Italian surgeons claim that thrombosis is frequent after operations for inguinal hernia and rare after operations for crural hernia. The complication is especially observable in men. It is as frequent in adolescents as in aged individuals.

In a few cases, as associated conditions, phlebitis of the spermatic vein, phlebitis of the femoral vein, of the iliac vein, of the same or of the opposite side co-existed. Banti examined a femoral thrombus. No germs were present, and the vein wall appeared normal. However, more observations are needed as to this point. At times there will be found associated complications explaining emboli (periprostatic phlebitis, rectal ulcerations). At times, careful search fails to reveal any lesions in the spermatic, epigastric, femoral, or iliac vessels.

Aimé Paul Heineck.

Technique of Subperitoneal Gall-bladder Extirpation (Zur Technik der subperitonealen Gallenblasen extirpation). Rudolf Frank. *Wien. klin. Wochenschr.*, 1909, xxii, 879.

Frank, after bringing the gall-bladder into the wound, divides the peritoneum at its base, leaving a spindle-shaped portion attached to the bladder wall. He strips off the peritoneum down to the cystic duct by blunt dissection, ligates the cystic artery and removes the gall-bladder, pressing out any stones which may be present in the cystic duct. The peritoneum is closed with a purse string suture. No drainage.

Of 14 cases of gall-stones — 9 in the cystic duct and 5 in the gall-bladder — of these 13 recovered without incident, one died of gastric dilatation.

C. G. Grulee.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF GYNECOLOGY

UNDER THE CHARGE OF

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J. C. HOLLISTER, M. D. — GEO. DE TARNOWSKY, M. D.
GERRY R. HOLDEN, M.D. — CAREY CULBERTSON, M. D.

Conservative Surgery of the Uterus and Ovaries. Its Possibilities from the Experimental Standpoint. E. SCOTT CARMICHAEL. *Edinburgh Medical Journal*, February, 1909.

The detailed experiments upon which this paper is based are found in the *Proceedings of the Royal Society of London*, vol. xxix, 1907, and in the *Journal of Physiology*, February, 1908. A large number of them were performed in conjunction with Dr. F. H. A. Marshall.

Certain conditions which, clinically, were formerly believed to be pathological, are no longer accepted as indications for removal of the ovary. In the light of experimental investigation, a small amount of ovarian tissue has the power of exerting its influence on the general economy, so that the small cystic ovary, the corrhotic ovary, or the ovary imbedded in peritoneal adhesions, need not be condemned to extirpation. Ovarian activity does not depend upon the presence of the uterus as suggested by some authorities (Blair Bell), and the uterus, after removal of the ovaries, does not retain its functional activities. Removal of the ovaries in adult rabbits always caused atrophy of the uterus, and in young rabbits, the uterus ceased to grow. These facts seem to disprove the presence of any substance such as "*uterin*" having a controlling power on the uterus.

The preservation of the uterine mucous membrane by subtotal hysterectomy, and the theory of Abel and Zweifel, is not supported by experimental evidence. The removal of the uterus in adult rabbits had no effect upon the functions of the ovaries, and in living rabbits, after hysterectomy, the ovaries continued to grow to maturity, and showed evident signs of their power of ovulation. Thus from the operative standpoint the preservation of ovarian tissue, after removal of the uterus, is always all-important, whereas the uterus alone is of no value physiologically without the ovaries. Much can be done surgically to conserve ovarian tissue, and experimentally the ovary has shown itself to have marked power of compensation. Resection of the ovary in young rabbits has shown this power in a striking degree. Removal of a single ovary gives rise to compensating hypertrophy of the opposite ovary. Removal of all but one-fifth of an ovary in a rabbit showed that this small piece of tissue hypertrophied to the size of the normal ovary, and the animal became pregnant and gave birth to five young ones. Ovarian grafting is still another means of preserving the ovarian influence. Too much must not be expected of it, as the transplantation of large masses of tissue is generally associated with failure, but small portions may be grafted with considerable chance of success. Reference is made to twenty-one experiments by the author.

The conservative surgery of the Fallopian tube is as yet in its infancy, but in the future, adherent tubes, tubal abscess, closed tubes, and ectopic tubal pregnancy should not be considered indications for its extirpation. CAREY CULBERTSON.

"Red Degeneration" of Uterine Myomata. J. LORAINE SMITH AND WM. FLETCHER SHAW. *Journal of Obstetrics and Gynæcology of the British Empire*, April, 1909.

This study is based upon the examination of specimens from five cases, three contributed by Archibald Donald, and one each by W. K. Walls and W. W. Lea, all of Manchester. Donald's cases were all connected with pregnancy. In the first, the tumor had evidently been present during the pregnancy, and the serious symptoms commenced two days after confinement The pain was not prominent, but the patient was obviously ill, and her symptoms suggested a form of toxæmia. In case two the acute symptoms arose during the course of pregnancy. The uterus increased rapidly, pain being the most prominent symptom. There was not the marked evidence of toxæmia here, yet she was so ill that there was probably some absorption of toxic products. In case three the fibroid was discovered at once following confinement. It was not adherent, nor was the general health very profoundly affected, yet the symptoms were such as to lead to the belief that degenerative processes were occurring. Case 4 occurred in a woman who had had three pregnancies. There was a rapidly growing tumor in the abdomen, with pressure symptoms, menorrhagia, but no signs of toxæmia. The fifth patient aborted spontaneously in the fourth month of gestation, followed by a difficult manual removal of the placenta, at which time the fibroid was discovered. Twenty days later there developed hyperpyrexia, sweating, and general symptoms of infection, with pain and a scanty, offensive secretion.

The writers conclude:

1. The chief change found in "red degeneration" of fibroids consists in thrombosis of the blood-vessels.

2. The thrombosis and red coloration may commence at the periphery of the tumor.

3. The tumors are also in a state of degeneration as evidenced by a homogeneous material separating the muscle bundles in many places.

4. The tumor contains fat and fat crystals, probably derived from the breaking up of the muscle bundles.

5. The tumors are liable to become infected by septic organisms and so give rise to acute toxic symptoms.

6. Pregnancy is probably a predisposing factor in the causation of this condition. CAREY CULBERTSON.

The Operative Treatment of Rupture of the Uterus with an Account of Three Cases Treated by Abdominal Hysterectomy. EDEN. *Proceedings Royal Society of Medicine*, 1909, ii, 265.

Eden reports three cases of rupture of the uterus treated by abdominal hysterectomy with one death due to recurrent hæmorrhage. He urges that the shock accompanying rupture of the uterus obscures any intra-abdominal hæmorrhage if such exists, and thinks that every case should be operated.

C. G. GRULEE.

A Series of Ten Cases of Complete Rupture of the Uterus. A. LIONAL SMITH. *Proceedings Royal Society of Medicine*, 1909, ii, 274.

Smith reports ten cases of rupture of the uterus with nine deaths. In regard to the frequency of uterine rupture he states that in the last twenty years there have been delivered 10,989 women in the General Lying-in Hospital of London with eight cases of rupture of the uterus, or 1 in 1,373 deliveries. He thinks that this is too high a percentage and believes a fairer estimate would be to consider only the two which developed in the hospital giving 1 case to every 5,500 pregnancies. He favors the non-operative treatment because the patients, as he thinks, are not able to stand an operation. C. G. GRULEE.

The Demarkation Between Conservative and Radical Operations for Uterine Myoma (Die Abgrenzung der Konservativen und der Radikal Operationen bei Uterusmyom). W. TAUFFER. *Abhandlungen an der Gebiete der Geburtshilfe und Gynäkologie*, 1909, h. 1.

In this article Tauffer makes an earnest plea for the universal classification of gynæcological statistics. He deplores the fact that an enormous amount of valuable scientific information must be sacrificed because of the unexpressed individual definitions under which various authors classify their writings. After an exact interpretation of his meaning of radical and conservative operations he elaborates with many subdivisions and with conscientious detail the results obtained by him in 227 personal supravaginal operations, and 88 vaginal operations which he did according to Doyen's method. He arrives at the conclusion that the most desirable surgical procedure for uterine fibroid is the radical which is recommended by Chrobak. He believes that Doyen's vaginal method should be considered only when we have a comparatively small tumor with healthy surroundings, or when there is complicated with the fibroid tumor, pus in the adnexa or surrounding parts. In women under forty years of age we must give preference to a conservative operation in the hope of a possible conception, at the same time he emphatically warns the gynecologist to bear in mind that the fatality in this operation is twice as great as if the radical is performed. He devotes considerable space to the symptomatic and psychical considerations of leaving in the ovary when possible, to anticipate the artificial menopause. He also gives statistics bearing on the primary and end results of this conservative measure and says that the scale weighs heavier in favor of total extirpation of both ovaries, in other words, a radical operation for uterine myoma, especially so when the woman has reached the age of 40 years.

Vulvar Leucoplasia and Epithelioma. DR. UBALDO CHIARABBA. *La Gynecologia Moderna*, May, 1909.

Patient 50 years old, mother of nine children. In perfect health until October, 1906, when she began to suffer intensely from pruritus vulvæ, followed two months later by the appearance of a small tumor on the inner surface of the right labium majus. This tumor was tender, bright red in color and bled readily. The mucosa of the external genitals was of a uniform white color; from the urinary meatus to the perineum the mucocutaneous parts appeared to be covered by a thick coat of adherent mother-of-pearl tissue.

The appearance of this area was like that produced by a silver nitrate cauterization. Histological examination of the tissues revealed the following pathological changes:

1. Inflammatory changes of the mucocutaneous tissues consisting in (*a*) hyperkeratosis of the stratum corneum with thickening of the stratum granulosum; (*b*) increased number of eleidin cells; (*c*) thickening of the stratum malpighii with hypertrophy and hyperplasia of the interpapillary lobules; (*d*) active proliferation of the elements of the stratum basale; with irregular invasion of new cells; (*e*) enlargement of dermal papillæ with vascular dilatation, leucocytosis and increase in connective tissue, fasciculi, and elastic tissue cells.

2. A circumscribed alteration of the malpighian epithelium into lobular and tubular pavement epithelioma.

Treatment consisted in a radical excision of all the tissues involved. GEORGE DE TARNOWSKY.

BOOK REVIEWS

SPECIAL SURGICAL DIAGNOSIS. By Professor F. de Quervain, Privat Dozent in the University of Bern and Oberarzt in the Surgical Department of the Hospital at La Chaux-de-Fonds. Leipzig: F. C. W. Vogel, 1909.

This excellent book appears in complete second edition, parts of it being revised. Its 650 pages containing 392 illustrations, many of which are skiagraphs, and three tables, are made up largely from material appearing at the clinic of Professor Kocher, to whom the book is dedicated.

Upon this wealth of material have been applied the means of diagnosis, many of which are new and important matter of this concisely written and valuable volume.

The author's large experience as a teacher has impelled him, in compiling this work, to keep the comprehension and needs of the student in mind, and by so doing he has taken up in a systematic and logical way the different points in their relation to the case in hand leading up to a clear and concise diagnosis.

Many complex theories which tend to confuse the student, and practitioner as well, have been avoided, the text being confined first to the cardinal symptoms of each malady, then excluding other conditions, the differentiation of diseases and conditions which occur in the parts or regions affecting the one which is the subject of the particular text in hand is fully taken up.

One might think that a single volume covering such a broad field would be largely a compilation of unconnected facts, but by a careful perusal of the text one is struck by the sequence of conditions and never losing sight of the subject, he arrives at a clear cut picture of the case in hand.

It is not the intention of the author that the book replace larger and more comprehensive treatises, but that the sequence of the most important signs and symptoms as they appear in any given surgical disease, clearly pointed out may be of service to both student and practitioner as well.

The book is divided into six parts dealing with surgical diseases of, first the head, second the neck, third the thorax, fourth the abdomen and intestines, fifth the pelvis and spinal column, sixth the extremities.

The pages devoted to brain complications following middle-ear disease are of particular interest, the author shows by a scheme the different areas which may be affected, with a table of symptoms caused by affection of each area.

Under the subject of surgical epilepsy it is pointed out that the most important consideration is the establishment of the fact that the case in hand is one amenable to surgical interference, this fact not being clearly established, it is better to allow it to remain as a medical case.

In speaking of heart-injuries the author says, "When, after a wound occurs it is possible that the heart may have been injured, severe disturbance of the heart's action with or without acute anæmia occurs, it is probable that the heart *has been* injured whether or not the heart dullness be increased. When these symptoms are progressive in spite of a slight or transitory improvement of the patient, surgical interference is indicated."

The book merits a careful translation into the English language. HERBERT A. POTTS.

SYMPTOMS AND THEIR INTERPRETATION. By James Mackenzie, M. D., M. R. C. P. London: Shaw & Sons, 1909.

The author takes a new view-point in an academic discussion of pain, and its accompanying nervous phenomena. The study of pain is a valuable aid to diagnosis; the recognition of reflex phenomena uncovers the sources of symptoms and facilitates their interpretation.

The general practitioner often underestimates the value of his opportunities for the observance, investigation, and comparative study of the early stages of disease. The more recondite laboratory methods usually deal with an advanced condition.

The work is a scholarly one; during twenty years' general practice a well-classified series of studies of visceral symptoms has been worked out, the heart being the type, and a diagnostic work of real value given to the medical profession. W. E. DODGE.

WHARTON'S MINOR AND OPERATIVE SURGERY, INCLUDING BANDAGING. By Henry R. Wharton, M. D. Philadelphia: Lea & Febiger, 1909.

In this seventh edition of Wharton's well known book, there has been some rearrangement of the volume. Considerable new material has been added as well as a number of new illustrations. For the most part, however, it presents the same appearance as the earlier editions, and to those who are acquainted with it, needs no recommendation, since its scope which it covers thoroughly is well known, ranking as it does as one of the best if not the best of the smaller manuals upon this subject.

DIE KRANKENPFLEGE IN DER CHIRURGIE. By Dr. H. A. Laan of Utrecht. An authorized translation from Dutch into German by Dr. Med. Albert Caan of Maastricht. With a preface by Prof. Dr. Arthur Schlossmann, Direktor der akademischen Klinik für Kinderheilkunde in Düsseldorf. Leipzig: F. C. W. Vogel, 1909.

In this volume of over three hundred pages the author offers a work on surgical nursing that is exceptionally valuable, especially in Germany, whose literature is peculiarly deficient in this subject. After the inevitable "Einleitung," wherein the nurse is briefly warned as to the harm of too much knowledge and as to how the surgical nurse's duties differ from those of the nurse in general practice, the author takes up the subject of "Wounds." This with the following chapters on "Infektion," is treated of excellently from the nurse's point of view. The subject matter is presented briefly, concisely, and in arrangement of text well adapted to be readily grasped. Care is apparent in the avoidance of the excessive use of scientific terms. The different kinds of wounds, their significance with respect to the entire body, the manner of wound-healing, and the influence of the various factors on the healing process is explained. Infection and its causes, with very little on bacteriology, is presented, its influence on the general system, and how the reaction takes place, the various forms of infection and the "Bekämpfung" against it are taken up in turn.

Next asepsis, antisepsis, and disinfection, under the general heading of "Disinfection and Wound Treatment" is discussed. Section four includes the duties of the nurse in the operating room, the preparation and arrangement of the instruments and of all other surgical supplies, with several pages devoted to unusually apt instruction regarding anæsthesia. The transportation of the patient and his after care concludes this portion of the subject.

The duties of the nurse in the surgical ward are presented in an equally clear and concise manner. Wound dressing, the various surgical positions, bandaging, and the minor surgical procedures are discussed. Finally a few words are given for the general nurse in private practice. Throughout, the text is amplified by numerous illustrations which add much to the value of the work. As has been already stated, the subject matter is presented briefly and concisely, is well arranged, and is largely free from that discursiveness which we have come to regard as rather characteristic of scientific German. Indeed, while American medical literature is fairly well provided with works on this subject, it would be a distinct advantage to have an adequate translation of this volume in the library of the hospital and training school. CAREY CULBERTSON.

HANDBOOK ON DISEASES OF ANUS AND RECTUM. By Louis J. Hirschman, M. D. St. Louis: C. V. Mosby Co.

The author has fully and completely covered the ground for which his work was intended.

It is not a complete work covering the whole field of diseases of the anus and rectum, but treats exclusively with those diseases which can be treated in the office, and in a large measure by the general practitioner.

The subject of local anæsthesia in these parts is described in detail, giving the technique of its uses in each case, for external hæmorrhoid-fissure in ano fistula, perineal abscess, etc. Many conditions which previously have required a general anæsthetic, the author treats by the regional methods. For the operative measures requiring a general anæsthesia and confinement in bed, the reader is referred to more complete works.

The chapter on dysentery, especially amœbic dysentery, is without its equal in many larger works.

The illustrations are clear and instructive, the local application and method of applying same for fissures, ulcerations, etc., are all described.

The book is printed on unusually good paper, the type is large, clear, and easy to read. W. J. MARVEL.

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